Mowery, Marci.
Pennsylvania Songbirds

# PENNSYLVANIA SONGBIRDS:

## A K-12 TEACHER'S GUIDE FOR ACTIVITIES IN THE CLASSROOM

**By:** Marci Mowery, *National Audubon Society*
Theresa Alberici, *Pennsylvania Game Commission*
Lisa Bainey, *DCNR, PA Bureau of State Parks & Bucktail Audubon Society*
Terri Kromel, *DCNR, PA Bureau of State Parks*

**Illustrations by:** Mike Begenyi and Bonnie Tweedy, *unless otherwise noted*

**Printed and Designed by:** Art Communication Systems, Inc.

**Project Director:** Marci Mowery, *National Audubon Society, Population & Habitat Campaign & Audubon Council of Pennsylvania*

**Project Coordinators:** Theresa Alberici, *Pennsylvania Game Commission*
Marci Mowery, *National Audubon Society and Audubon Council of Pennsylvania*

A cooperative project of the Audubon Council of Pennsylvania, the National Audubon Society Population and Habitat Campaign, Pennsylvania Game Commission, Department of Conservation and Natural Resources, PA Bureau of State Parks and PA Partners in Flight.

Publiction partially funded through a Pennsylvania Wild Resource Conservation Fund grant, allocated by the PA Game Commission.

© 1998, National Audubon Society, PA Field Office; PA Game Commission, PA Wild Resource Conservation Fund, DCNR, and the PA Bureau of State Parks.

National Audubon Society

## Interns

Dave Barone, *Messiah College*
Kris Paxson, *Shippensburg University*
Jeannine Risden, *Shippensburg University*
Drew Sauer, *Shippensburg University*
Christine Simonson, *Shippensburg University*

## Reviewers:

JoAnn Albert, *Program Coordinator, Jennings Environmental Education Center*
Tingle Barnes, *Coordinator of Environmental Education, Beechwood Farms Nature Reserve, Audubon Society of Western Pennsylvania*
Linda Boice, *Naturalist, Mill Grove Wildlife Sanctuary*
Daniel Brauning, *State Ornithologist, PA Game Commission*
Tim Conway, *Wildlife Education Supervisor, PA Game Commission*
Mary Deinlein, *Bird Conservation Specialist, Smithsonian Migratory Bird Center*
Tim Marks, *Wildlife Education Supervisor, PA State Parks*
Don Martin, *Wildlife Education Supervisor, PA Game Commission*
Kate Nekuza, *Educator*
Bob Schell, *Appalachian Audubon Society*
Chuck Yohn, *Biology Department, Juniata College Biological Field Station*
David Young, *Regional Environmental Education Specialist, DCNR*
Patty Vathis, *Environment & Ecology Advisor, Pa Department of Education*

## Special Thank You To:

Audubon Chapters and Members for their support.
Cornell Laboratory of Ornithology
Department of Conservation and Natural Resources, Bureau of State Parks
Partners In Flight
Pennsylvania Game Commission
Pat Waak, *Director, National Audubon Society Population and Habitat Campaign*

## Editors:

Karen Hoffman-Atwood, *Atwood Communications*
Pam Metzger

# The Activities
# *Table Of Contents*

## CHAPTER 1—BIRD BIOLOGY

Activities and background information to introduce basic bird biology and the characteristics that differentiate songbirds from other groups of birds.

**Background** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1

**Lesson 1—Vertebrates Have Class (Grades 3-6)** . . . . . . . . . . . . . . . . . . . . . 8
*Students compare and contrast pictures of vertebrates. Upon completion, a game reinforces what they have learned.*

**Lesson 2—Flying With The Birds (Grades K-8)** . . . . . . . . . . . . . . . . . . . . . 11
*Students become birds through fantasy reading, then discuss the changes that had to occur in their bodies to become birds.*

**Lesson 3—Feathers (Grades 3-12)** . . . . . . . . . . . . . . . . . . . . . . . . . . . 16
*Students examine a feather and predict functions of different types of feathers.*

**Lesson 4—Bones (Grades K-6)** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 20
*Students examine bone characteristics of birds and other vertebrates.*

**Lesson 5—Vision (Grades K-6)** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 22
*Students compare monocular and binocular vision in birds and other animals.*

**Lesson 6—Beaks and Tongues (Adaptable)** . . . . . . . . . . . . . . . . . . . . . . . 24
*Students investigate variation in bird beaks and food preferences.*

**Lesson 7—Feet Are Neat (Grades K-5)** . . . . . . . . . . . . . . . . . . . . . . . . . 30
*Students observe and evaluate how different types of bird feet are used.*

**Lesson 8—Gizzards (Grades K-6)** . . . . . . . . . . . . . . . . . . . . . . . . . . . . 33
*Students, using a mortar and pestle, demonstrate how a gizzard functions.*

**Lesson 9—Eggs (Adaptable)** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 35
*Students observe the development of bird eggs.*

**Lesson 10—Birds of a Feather (Grades 4-6)** . . . . . . . . . . . . . . . . . . . . . . 37
*Students explore the concept of classification by building a human and bird key.*

**Lesson 11—Birds and Worms (Grades K-6)** . . . . . . . . . . 45
*Students explore the concept of camouflage through a simulation activity.*

**Lesson 12—Adaptation Artistry (Grades 4-9)** . . . . . . . . . . 49
*Students design, create and report on bird adaptations.*

## CHAPTER 2—HABITAT

Background information and activities designed to introduce critical wildlife concepts like habitat components, niche, habitat evaluation and habitat loss.

**Background** . . . . . . . . . . 53

**Lesson 1—Everybody Needs A Home (Grades K-3)** . . . . . . . . . . 57
*Students draw pictures of homes and compare human needs to those of other animals.*

**Lesson 2—Which Bird Goes Where? (Grades K-5)** . . . . . . . . . . 59
*Students construct posters of three different bird habitats.*

**Lesson 3—Habitat Lap Sit (Grades 4-9)** . . . . . . . . . . 61
*Students physically form an interconnected circle to demonstrate components of habitat.*

**Lesson 4—Natural Community Profile (Grades 4-6)** . . . . . . . . . . 64
*Students survey a natural area and compare similarities and differences between natural and human communities.*

**Lesson 5—Shrinking Habitat (Grades 4-7)** . . . . . . . . . . 71
*Students simulate a process of land development in a physically involving activity.*

**Lesson 6—Bird Habitat Evaluation (Grades 5-12)** . . . . . . . . . . 75
*Students conduct a habitat survey and evaluation.*

**Lesson 7—Which Niche for Birds (Grades 7-12)** . . . . . . . . . . 82
*Students compare ecological niches with careers in the community.*

## CHAPTER 3—OBSERVING AND IDENTIFYING SONGBIRDS

Background information and activities that explore bird identification through behavioral and physical features, bird song, habitat associations and written records.

**Background** . . . . . . . . . . 85

**Lesson 1—How To Identify A Bird (Grades 4-8)** . . . . . . . . . . 94
*Students learn how to identify birds through observation and written descriptions of key field marks.*

**Lesson 2—Bird Behavior Bingo (Grades K-3)** . . . . . . . . . . 100
*Students play a bird behavior bingo game on a hike.*

**Lesson 3—Observing Birds In The Wild (Grades 4-12)** . . . . . . . . . . 103
*Students participate in a scavenger hunt for different bird behaviors.*

**Lesson 4—A Dawn Chorus (Grades K-6)** . . . . . . . . . . 108
*Students learn bird songs by imitating a bird chorus and participating in a game of musical chairs.*

**Lesson 5—Songbirds And Their Nests (Grades 3-6)** . . . . . . . . . . 116
*Students find and observe bird nests.*

**Lesson 6—Build A Nest (Grades 3-8)** . . . . . . . . . . 124
*Students build a bird nest using natural materials.*

**Lesson 7—Taking A Closer Look (Grades 4-12)** . . . . . . . . . . 129
*Students construct and use a blind to observe birds and other wildlife.*

**Lesson 8—Wild Words... A Journal For The Birds (Grades 4-12)** . . . . . . . . . . 131
*In a journal format, students observe and describe songbirds and their habitat.*

## CHAPTER 4—MIGRATION

Background information and activities that explore the obstacles encountered, the physical abilities required, and the routes and distances many songbirds travel.

**Background** . . . . . . . . . . 135

**Lesson 1—Geography Is For The Birds (Grades 5-8)** . . . . . . . . . . 141
*Students chart the paths of four Pennsylvania birds using an atlas and specific migratory directions.*

**Lesson 2—An Eventful Journey (Grades 4-6)** . . . . . . . . . . 149
*Students become migrating birds, and encounter obstacles of migration through an active simulation.*

**Lesson 3—Avian Olympics (Grades 4-8)** . . . . . . . . . . 158
*Students learn about birds' physical abilities and the difficulties of migration by competing in physical activities (incorporates math skills).*

**Lesson 4—Habitat Squeeze (Grades 4-8)** . . . . . . . . . . 168
*Students experience habitat loss for songbirds through a simulation in the classroom.*

**Lesson 5—Forest Fantasy (Grades 4-8)** . . . . . . . . . . 172
*Students visualize a forest in Pennsylvania and a forest in Nicaragua through an imaginary field trip.*

## CHAPTER 5—SONGBIRD RESEARCH TECHNIQUES

Background information and activities that introduce research methods for observing bird populations and trends.

**Background** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .177

**Lesson 1—In Search of ... Flocking Songbirds (Grades K-6)** . . . . . . . . . . . . . . . . . . . . . . . . . . . .182
*Students observe birds in the wild, and record locations where birds flock and the behavior of birds in a flock.*

**Lesson 2—Feeder Frenzy (Grades 4-9)** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .186
*Students design and conduct bird feeder experiments.*

**Lesson 3—Designing Researchers (Grades 7-12)** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .195
*Students design a research project to study the population distribution of a songbird living in their area.*

**Lesson 4—Buddy Banding (Grades 7-12)** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .198
*Students participate in a simulation activity that involves banding fellow classmates.*

**Lesson 5—Migratory Mapping (Grades 6-12)** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .202
*Using maps and research data, students chart the migratory routes of two Pennsylvania songbirds.*

**Lesson 6—Nest Boxes (Grades 4-12)** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .213
*Students design and conduct a nest box monitoring project.*

**Lesson 7—How Many Birds? (Grades 5-12)** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .217
*Students construct and use a frame viewer to estimate the size of a flock of birds.*

**Lesson 8—Bird Song Survey (Grades 9-12)** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .220
*Students investigate an area and use bird counting techniques.*

**Lesson 9—Mini-Breeding Bird Atlas (Grades 4-12)** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .223
*Students conduct a mini-breeding bird survey in or around school grounds to create a mini-breeding bird atlas.*

**Lesson 10—Christmas Bird Count (Grades 10-12)** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .226
*Students examine trends in the populations of 13 species of birds by interpreting Christmas Bird Count data.*

## CHAPTER 6—BIRDS AND PEOPLE

Background information and activities that focus on the interaction between people, birds and the areas they inhabit.

**Background** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .235

**Lesson 1—If There Were No Birds (Grades 4-12)** .......... 238
*Students examine ways birds are beneficial and valuable to people and natural systems by completing a thought-provoking sentence.*

**Lesson 2—The Lorax by Dr. Seuss (Adaptable)** .......... 241
*Student listen to and discuss a story or watch a video about a forest that is destroyed.*

**Lesson 3—Changes in the Land (Grades 6-12)** .......... 243
*Students research how the local community and surrounding area has changed since the time of European settlement.*

**Lesson 4—Deciding Environmental Issues (Grades 5-12)** .......... 247
*Students read, discuss, make judgments on and write hypothetical dilemmas concerning wildlife and/or natural resources.*

**Lesson 5—Cowbird Capers (Grades 4-8)** .......... 255
*Students participate in a simulation of cowbird parasitism.*

**Lesson 6—Deadly Links (Grades 4-9)** .......... 259
*Students become hawks, shrews and grasshoppers in this physical activity that deals with toxins in the food chain.*

**Lesson 7—Investigating the Missing Birds (Grades 4-8)** .......... 263
*Students present a play.*

## CHAPTER 7—ACTION

Background information and activities that provide specific actions that can be taken to help songbirds.

**Background** .......... 271

**Lesson 1—Bird Feeding (Adaptable)** .......... 273
*Student create a feeding station for observing birds.*

**Lesson 2—Bluebird Trails (Grades 4-12)** .......... 278
*Using a checklist of bluebird habitat components, students assess local areas for the possibility of a bluebird trail.*

**Lesson 3—Adoption Option (All ages)** .......... 286
*Students adopt a park, refuge or bird.*

**Lesson 4—A Habitat For Birds (All ages)** .......... 288
*Students map a predetermined portion of the schoolyard for its habitat potential and make recommendations for improving habitat on the site.*

**Lesson 5—Menu of Actions (All ages)** .......... 291
*A menu of possible actions students can take.*

## APPENDIX

Bibliography for Chapter Background Information and Appendices . . . . . . . . . . . . . . . . . . . . . . . .295

Glossary . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .297

Book List . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .311

Resource List . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .317

List of Wildlife Rehabilitators . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .332

Wings Across Pennsylvania: Connecting Songbirds and Habitat
(A Jeopardy Game) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .334

Teaching Controversy, A Background Information Sheet . . . . . . . . . . . . . . . . . . . . . . . . . . . . .336

Audubon's Birds — A listing of birds from *Birds of America* that are now
threatened, endangered or extinct . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .337

Songbird Information Sheets . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .338

Nest Cards . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .359

Songbird Cards . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .365

Habitat Cards . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .377

# Activities by Grade

| **Chapter 1 Bird Biology** *Activities* | *Lesson Number* | K | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vertebrates Have Class | 1 |  |  |  | * | * | * | * |  |  |  |  |  |  |
| Flying With The Birds | 2 | * | * | * | * | * | * | * |  |  |  |  |  |  |
| Feathers | 3 |  |  |  | * | * | * | * | * | * | * | * | * | * |
| Bones | 4 |  |  |  | * | * | * | * | * | * | * | * | * | * |
| Vision | 5 | * | * | * | * | * | * | * |  |  |  |  |  |  |
| Beaks and Tongues | 6 | * | * | * | * | * | * | * | * | * | * | * | * | * |
| Feet Are Neat | 7 | * | * | * | * | * | * |  |  |  |  |  |  |  |
| Gizzards | 8 | * | * | * | * | * | * | * |  |  |  |  |  |  |
| Eggs | 9 | * | * | * | * | * | * | * | * | * | * | * | * | * |
| Birds of a Feather | 10 |  |  |  |  | * | * | * |  |  |  |  |  |  |
| Birds and Worms | 11 | * | * | * | * | * | * | * |  |  |  |  |  |  |
| Adaptation Artistry | 12 |  |  |  |  | * | * | * | * | * | * |  |  |  |

| **Chapter 2 Habitat** *Activities* | *Lesson Number* | K | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Everybody Needs A Home | 1 | * | * | * | * |  |  |  |  |  |  |  |  |  |
| Which Bird Goes Where? | 2 | * | * | * | * | * | * |  |  |  |  |  |  |  |
| Habitat Lap Sit | 3 |  |  |  |  | * | * | * | * | * | * |  |  |  |
| Natural Community Profile | 4 |  |  |  |  | * | * | * |  |  |  |  |  |  |
| Shrinking Habitat | 5 |  |  |  |  | * | * | * | * |  |  |  |  |  |
| Bird Habitat Evaluation | 6 |  |  |  |  |  | * | * | * | * | * | * | * | * |
| Which Niche For Birds | 7 |  |  |  |  |  |  |  | * | * | * | * | * | * |

| **Chapter 3 Observing and Identifying Songbirds** *Activities* | *Lesson Number* | K | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| How to Identify a Bird | 1 |  |  |  |  | * | * | * | * | * |  |  |  |  |
| Bird Behavior Bingo | 2 | * | * | * | * |  |  |  |  |  |  |  |  |  |
| Observing Birds in the Wild | 3 |  |  |  |  | * | * | * | * | * | * | * | * | * |
| A Dawn Chorus | 4 | * | * | * | * | * | * | * |  |  |  |  |  |  |
| Songbirds and Their Nests | 5 |  |  |  | * | * | * | * |  |  |  |  |  |  |
| Build A Nest | 6 |  |  |  | * | * | * | * | * | * |  |  |  |  |
| Taking A Closer Look | 7 |  |  |  |  | * | * | * | * | * | * | * | * | * |
| Wild Words-A Journal For the Birds | 8 |  |  |  |  | * | * | * | * | * | * | * | * | * |

| **Chapter 4**<br>**Migration**<br>***Activities*** | *Lesson Number* | **K** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Geography Is For The Birds | 1 | | | | | | * | * | * | * | | | | |
| An Eventful Journey | 2 | | | | | * | * | * | | | | | | |
| Avian Olympics | 3 | | | | | * | * | * | * | * | | | | |
| Habitat Squeeze | 4 | | | | | * | * | * | * | * | * | * | * | * |
| Forest Fantasy | 5 | | | | | * | * | * | * | * | | | | |

| **Chapter 5**<br>**Songbird Research Techniques**<br>***Activities*** | *Lesson Number* | **K** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| In Search of Flocking Birds | 1 | * | * | * | * | * | * | * | | | | | | |
| Feeder Frenzy | 2 | | | | | * | * | * | * | * | * | | | |
| Designing Researchers | 3 | | | | | | | | * | * | * | * | * | * |
| Buddy Banding | 4 | | | | | | | | * | * | * | * | * | * |
| Migratory Mapping | 5 | | | | | | | * | * | * | | | | |
| Nest Boxes | 6 | | | | | * | * | * | * | * | * | * | * | * |
| How Many Birds? | 7 | | | | | | * | * | * | * | * | * | * | * |
| Bird Song Survey | 8 | | | | | | | | | | * | * | * | * |
| Mini-Breeding Bird Atlas | 9 | | | | | * | * | * | * | * | * | * | * | * |
| Christmas Bird Count | 10 | | | | | | | | | | | * | * | * |

| **Chapter 6**<br>**Birds and People**<br>***Activities*** | *Lesson Number* | **K** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| If There Were No Birds | 1 | | | | | | | * | * | * | * | * | * | * |
| *The Lorax* by Dr. Seuss | 2 | * | * | * | * | * | * | * | * | * | * | * | * | * |
| Changes In The Land | 3 | | | | | | | * | * | * | * | * | * | * |
| Deciding Env. Issues | 4 | | | | | | * | * | * | * | * | * | * | * |
| Cowbird Capers | 5 | | | | | * | * | * | * | * | | | | |
| Deadly Links | 6 | | | | | * | * | * | * | * | * | | | |
| Investigating the Missing Birds | 7 | | | | | * | * | * | * | * | | | | |

| **Chapter 7**<br>**Action**<br>***Activities*** | *Lesson Number* | **K** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bird Feeding | 1 | * | * | * | * | * | * | * | * | * | * | * | * | * |
| Bluebird Trails | 2 | | | | | * | * | * | * | * | * | * | * | * |
| Adoption Option | 3 | * | * | * | * | * | * | * | * | * | * | * | * | * |
| A Habitat For Birds | 4 | * | * | * | * | * | * | * | * | * | * | * | * | * |
| Menu of Actions | 5 | * | * | * | * | * | * | * | * | * | * | * | * | * |

# Activities by Subject

| **Chapter 1 Bird Biology *Activities*** | ***Lesson* #** | **Art** | **Language Arts** | **Math** | **Physical Ed** | **Science/ Environment Ecology** | **Social Studies** |
|---|---|---|---|---|---|---|---|
| Vertebrates Have Class | 1 | | | | | * | |
| Flying With The Birds | 2 | | | * | * | * | |
| Feathers | 3 | * | * | | | * | |
| Bones | 4 | | | | | * | |
| Vision | 5 | | | | | * | |
| Beaks and Tongues | 6 | | | * | * | * | |
| Feet Are Neat | 7 | * | * | | | * | |
| Gizzards | 8 | | | | | * | |
| Eggs | 9 | * | * | * | * | * | |
| Birds of a Feather | 10 | | | * | | * | |
| Birds and Worms | 11 | | | | * | * | |
| Adaptation Artistry | 12 | * | * | * | | * | |

| **Chapter 2 Habitat *Activities*** | ***Lesson* #** | **Art** | **Language Arts** | **Math** | **Physical Ed.** | **Science/ Environment Ecology** | **Social Studies** |
|---|---|---|---|---|---|---|---|
| Everybody Needs A Home | 1 | * | * | | | * | |
| Which Bird Goes Where? | 2 | * | | | | * | |
| Habitat Lap Sit | 3 | | | | * | * | |
| Natural Community Profile | 4 | * | * | * | | * | |
| Shrinking Habitat | 5 | | | | | * | * |
| Bird Habitat Evaluation | 6 | | * | * | | * | |
| Which Niche For Birds | 7 | | * | | | * | * |

*Which Niche For Birds, also Career Education

| **Chapter 3 Observing and Identifying Songbirds *Activities*** | ***Lesson* #** | **Art** | **Language Arts** | **Math** | **Physical Ed.** | **Science/ Environment Ecology** | **Social Studies** |
|---|---|---|---|---|---|---|---|
| How to Identify a Bird | 1 | | * | | | * | |
| Bird Behavior Bingo | 2 | | | | | * | |
| Observing Birds in the Wild | 3 | | * | | | * | |
| A Dawn Chorus* | 4 | | | | | * | |
| Songbirds and Their Nests | 5 | | * | | | * | * |
| Build A Nest | 6 | * | | | | * | |
| Taking A Closer Look** | 7 | * | | | | * | |
| Wild Words-A Journal For the Birds | 8 | | * | | | * | |

*A Dawn Chorus- also, Music
**Taking A Closer Look- also, Industrial Arts

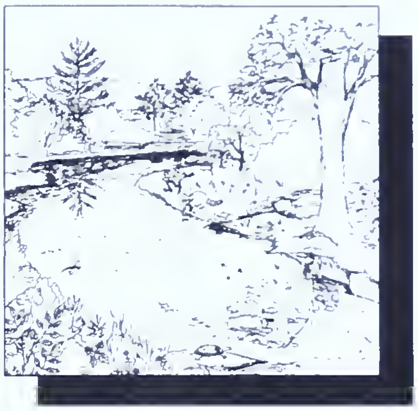
| **Chapter 4**<br>**Migration**<br>***Activities*** | ***Lesson*** **#** | **Art** | **Language Arts** | **Math** | **Physical Ed.** | **Science/ Environment Ecology** | **Social Studies** |
|---|---|---|---|---|---|---|---|
| Geography Is For The Birds | 1 | | | | | * | * |
| An Eventful Journey | 2 | | | | * | * | |
| Avian Olympics | 3 | | | * | * | * | |
| Habitat Squeeze | 4 | | | | | * | * |
| Forest Fantasy | 5 | * | * | | | * | |

| **Chapter 5**<br>**Songbird Research Techniques**<br>***Activities*** | ***Lesson*** **#** | **Art** | **Language Arts** | **Math** | **Physical Ed.** | **Science/ Environment Ecology** | **Social Studies** |
|---|---|---|---|---|---|---|---|
| In Search of Flocking Birds | 1 | | | * | | * | |
| Feeder Frenzy | 2 | | | * | | * | |
| Designing Researchers | 3 | | * | | | * | |
| Buddy Banding | 4 | | | * | | * | |
| Migratory Mapping | 5 | | | | | * | * |
| Nest Boxes | 6 | | | * | | * | |
| How Many Birds? | 7 | | | * | | * | |
| Bird Song Survey | 8 | | * | * | | * | |
| Mini-Breeding Bird Atlas | 9 | | | | | * | * |
| Christmas Bird Count | 10 | | * | * | | * | |

| **Chapter 6**<br>**Birds and People**<br>***Activities*** | ***Lesson*** **#** | **Art** | **Language Arts** | **Math** | **Physical Ed.** | **Science/ Environment Ecology** | **Social Studies** |
|---|---|---|---|---|---|---|---|
| If There Were No Birds | 1 | | * | | | | |
| *The Lorax* by Dr. Seuss | 2 | | * | | | * | |
| Changes In The Land | 3 | * | * | * | | * | * |
| Deciding Env. Issues | 4 | | * | | | * | * |
| Cowbird Capers | 5 | | | | | * | |
| Deadly Links | 6 | | | | * | * | * |
| Investigating the Missing Birds | 7 | * | * | | | * | |

| **Chapter 7**<br>**Action**<br>***Activities*** | ***Lesson*** **#** | **Art** | **Language Arts** | **Math** | **Physical Ed.** | **Science/ Environment Ecology** | **Social Studies** |
|---|---|---|---|---|---|---|---|
| Bird Feeding | 1 | * | | * | | * | |
| Bluebird Trails | 2 | * | | * | | * | |
| Adoption Option | 3 | | * | * | | * | |
| A Habitat For Birds | 4 | * | * | * | | * | |
| Menu of Actions | 5 | * | * | * | * | * | * |

# Background



What makes a bird, a bird? When asked this question, people often respond, "Birds are animals with wings." But, bats have wings, too, and they are not birds. What is it that makes eagles, ostriches, cardinals, ducks and hummingbirds birds? All birds share common characteristics, whether they are large or small, brown or red. For one thing, birds are the only animals that have feathers. Birds share many other characteristics as well. For example, all birds have wings, beaks, a four-chambered heart and some hollow bones. They are warm-blooded animals that reproduce by laying eggs. To understand what makes a bird a bird, we need to look at the sum total of these shared characteristics.

Birds make up a special class of vertebrates called Aves (Latin for bird) and are grouped into orders, families, and genera according to similarities in their bills, feet types, wing forms and other characteristics, some of which are internal.

Birds are believed to have developed from reptilian ancestors about 160 million years ago. Some reptilian characteristics are evident in birds even today, including scales on legs and feet, similar skulls and ear bones, and egg-laying. Birds come in many different shapes, sizes and colors. Each species is adapted to live, eat and reproduce in specific ecosystems. There are 9,000 species of birds worldwide. About 650 species occur in North America, north of Mexico, while Pennsylvania officially lists more than 350 species.

Passeriformes, or perching birds, is the order which includes songbirds. The name passerine comes from the Latin passer, which means sparrow. The passeriformes are the main focus for this publication.

Songbirds, with about 4,000 species worldwide, comprise nearly half of all bird species. Their diagnostic external characteristic is their perching feet—four toes, unwebbed, all on the same level with three toes in front and one behind, and an extremely well-developed internal characteristic: the syrinx or voice organ. Birds of this order include:

blackbirds
buntings
catbirds
chickadees
grosbeaks
jays
larks
kinglets
sparrows
tanagers
thrashers
thrushes

creepers
crows
finches
flycatchers
gnatcatchers
nuthatches
orioles
shrikes
swallows
starlings
titmouse
vireos
warblers
waxwings
wrens

Flight Feather

Down Feather

Contour Feather

## Feathers

Birds are the only animals with feathers. Birds have several different types of feathers, from stiff contour feathers, which cover the wings and bodies, to fluffy down feathers, which help insulate a bird and keep it warm. The most common type is the contour feather. Contour feathers are strong as well as lightweight. A contour feather's stem, or shaft, is a hollow tube made of a very hard material called keratin. (Reptile scales and human fingernails are also made of keratin.) Contour feathers are stiff yet flexible, and help streamline a bird to give it a smooth, sleek shape. Special contour feathers on the wings, called flight feathers, are shaped to fan the air, creating "lift," which helps the bird get off the ground, maneuver in the air, and land safely.

Besides helping birds fly, feathers help protect a bird's sensitive skin, just as hair helps protect a mammal's skin. Downy feathers are great insulators because they trap a bird's body heat. This insulation is one reason that birds can live in Antarctica and in other very cold places. Feathers also form brightly-colored crests and tail displays, which are important in courtship behavior.

Feathers grow much the way our hair grows. The base of each shaft is rooted in a tiny follicle in the skin and receives an ongoing supply of nutrients from the blood. When the feather is fully grown, the base of the shaft closes and the feather dies. Eventually it will fall out or be pushed out by a new feather that grows in the same follicle.

## Color

Birds are among the most brilliantly-colored members of the animal kingdom. The many color patterns of their plumage are important to mating rituals, as camouflage and for status.

The bright colors of birds, usually present on the male, are displayed in a "ruffling" effect to attract a female to mate. Males use colors and sometimes dance to entice the female. Color can also provide camouflage. Females often have dull coloring which helps them blend into their surroundings while they are sitting on the nest. In some species, both male and female have the same rather dull coloration. For example, birds which spend most of their time on the ground, such as ovenbirds, are often dull brown, with spots or stripes. This helps these birds blend in with the leaves on the forest floor.

## Winging It

The wings of a bird are attached to large chest muscles called the pectoral or flight muscles. In flying birds, the pectorals are large, powerful muscles. For example, the breast meat on a chicken or turkey is the bird's pectoral muscle.

Bird wings are streamlined like an airplane's wings, which enables them to zip through the air easily. The wings are curved on top (convex), and flat or slightly curved (concave) on the bottom. This special shape gives a flying bird the lift it needs to get off the ground. Once a bird takes off, the outer ends of the wings (where the main flight feathers attach) act like propellers and rudders, helping the birds move up, down and forward through the air.

The type of flying a bird does depends on the size and shape of its wings. For example, large soaring birds, like eagles and vultures, have long, broad wings. Forest birds, such as some owls, hawks and songbirds, have short, broad wings for diving in and out of thick vegetation. Birds that are fast fliers and spend a lot of time in the air, such as falcons and swifts, have long, pointed wings.

Wings are important even to flightless birds. Penguins use their wings as flippers to help them swim underwater, and wings help ostriches keep their balance as they gallop across the grasslands.

## Boning Up on Birds

Even though it doesn't weigh much, a bird's skeleton is very strong. Many of the bones are fused, or joined together. This gives the skeleton extra strength. Most of a bird's bones are hollow or partially hollow, with very thin braces of bone inside for support. (Mammals have thicker, denser, heavier bones.)

Having a very strong but lightweight frame is important. A bird's skeleton must be light enough to fly, yet strong enough to support large flight muscles and protect internal organs. The majority of a bird's weight is made up of its wing muscles.

## A Bird's Eye View

Most birds can see much better than other animals, including people. They have very large eyes in proportion to their body size, and can focus sharply on both nearby and faraway objects. Unlike many mammals, they can see color.

Bird's eyes, usually located on the sides of the head, can focus independently of each other, so that a bird can see two different images at the same time. This is called monocular vision. When they focus straight ahead, birds have binocular vision, with both eyes focusing on the same image. Some birds, like the owls, have binocular vision most of the time because their eyes

Perergrine

Birds have "faster" vision than humans, meaning that in a single glance they can pick up more detail.

face forward, just as humans do. (Binocular vision allows an animal to judge distance, making it easier to follow movement. Monocular vision gives an animal a wider field of vision.)

Even though birds can focus each eye independently of the other, their eyes are relatively fixed in their sockets so that they can't roll their eyes around the way we can. Instead, birds have to turn their heads to see different directions. That's why you often see birds twisting and cocking their heads. Some owls can twist their heads more than three-fourths of a full circle! Birds use their keen eyesight to locate food, keep an eye on enemies, spot mates, and find a place to live.

## Holes in the Head

Bird ears are located on each side of the head, just below and in back of the eyes. You usually can't see the ears though, because in most birds they are just small holes covered with feathers. The holes lead to the middle and inner ears, which are very sensitive to both high and low pitched sounds. Birds depend on their sense of hearing to find their prey, locate mates, and detect danger. Owls and other night-flying birds often have especially good hearing and can detect mice squeaking and leaves rustling from far away.

Woodcock

## Big on Beaks

Each type of bird has a different beak, depending on the kind of food it eats. Beaks in general are light, compared with the toothed mouth parts of mammals, a factor necessitated by the need to reduce weight for flight.

Birds use their beaks mainly to gather food and drink water. Some birds have hooked beaks to tear food, while others may have thick, heavy beaks for cracking seeds. Food is not ground in the beak, this activity is the job of the gizzard. The mandibles of the beak work like the jaw of a mammal—where the lower mandible moves away from the upper stationery mandible. The nostrils are housed in the upper mandible, enabling the bird to breath.

Beaks may also be used to collect nesting materials, preen feathers, scratch, attack enemies, caress mates and feed young.

## Smelling Like a Bird

Most birds seem to have a poorly developed sense of smell and rely on their keen sense of sight and hearing to find food and avoid predators. Scientists think that exceptons to this include the turkey vultures, kiwis, and a few other birds that sniff out their food as well as use their other senses.

## Tricky Tongues

Bird tongues come in all shapes and sizes. For example, hummingbirds have long, narrow, forked tongues, while woodpeckers have barbed, sticky tongues. American robins have tongues that are thin, horny and slightly curled. Birds use their tongues in many different ways—to taste, spear, hold, suck up, and even to tear food.

## Warm-blooded Birds

All birds are warm-blooded, just as mammals are, which means they maintain a constant body temperature even if the temperature around them changes. Cold-blooded animals, such as reptiles, fish, and amphibians, can control their body temperatures only by moving to warmer or cooler areas.

## A Special Gland

Most birds have a special oil gland, known as the uropygial gland, located just above the base of the tail. The oil gland secretes oil that the bird rubs over its feathers with its beak. The oil helps condition and clean the feathers and in some birds helps make the feathers water-repellent. Scientists also think the oil has special vitamins that are absorbed into the skin and help birds stay healthy.

## Take a Deep Breath

Birds have a very efficient breathing system. They have two lungs, with special balloon-like air sacs attached to each one. (Mammals also have two lungs, but they do not have air sacs.) The air sacs spread into different parts of a bird's body, including the hollow parts of the larger bones. They allow a bird to stir up more air, push more air through the lungs, and bring more oxygen to the cells. (Birds need a lot of oxygen to help turn the food in their cells into the extra energy necessary to fly and maintain a high body temperature.)

Air sacs may also help birds cool down if they get over-heated, and help some swimming birds stay afloat.

## Keeping Cool

Birds do not sweat to cool off, as people and other mammals do. (They don't have sweat glands). Instead, many birds pant, breathing in and out quickly in much the same way a dog pants. Panting cools the bird as water from the lungs, throat, mouth, and other parts of the body, evaporates. Birds also keep cool by taking a bath or sitting in the shade.

## Store it in the Crop

When food is swallowed, the muscles in a bird's esophagus push the food down the throat. In many birds, the bottom of the esophagus forms a sac called the crop. The crop stores undigested food before it enters the stomach. Birds that have a crop can gorge when they find a good food source, store the food in the crop, and than slowly digest it later.

## Teeth in the Stomach

Food passes from the crop or esophagus into the gizzard, the specialized muscular stomach of birds. Most birds have a gizzard, but it is more highly developed in seed-eating birds and birds that can eat hard-to-digest food.

Birds use their gizzards as other animals use their teeth—to grind and crush hard nuts, seeds, grain, and other foods. (Birds do not have teeth). Many seed-eating birds swallow small stones and grit that help the gizzard grind. (In owls, hawks, and some other birds, anything that can't be broken down in the stomach, such as feathers, fur, or bones, is stored in the gizzard and regurgitated as pellets.) Once ground, strong acids are secreted to help digest the food chemically.

Birds tend to eat energy-rich, high-calorie foods such as seeds, fruit, insects, worms, nectar, rodents and fish. Their choice of food reduces the quantity needed at a given time, which reduces the weight of food in the stomach.

The by-product of digestion is feces. Uric acid, a lighter, more concentrated waste, is a product of metabolism which forms around the feces.

## Courtship and Reproduction

Courtship is distinct for each species, and can involve a variety of rituals to attract a mate. Some bird species mate for life, while many of the songbirds mate only for the season. In the female bird, the oviduct produces one egg at a time. This prevents eggs from cracking each other on impact. The hard-shelled eggs are made of calcium carbonate. Eggs take only twenty-four hours from initial development to laying—this reduces the amount of time the female must bear the burden of the additional weight.

The testes of the male bird remain inside the body to retain the bird's aerodynamic outline. Testes shrink between breeding seasons to reduce body weight.

John Wiessinger

**Thrush**

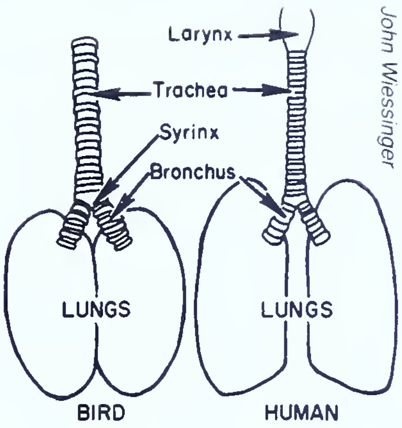
Some members of the thrush family are known fondly as "flute birds." The veery, with its unearthly, spiraling melody, is actually singing in harmony with itself.)

## Voicing It Together

Ornithologists (scientists who study birds) say there are two kinds of bird compositions: calls and songs. Calls are used to communicate the whereabouts of food, predators, mates or group members, and for delivering other general information. Songs are more complicated than calls. Songs are the mating calls and warning cries of the avian world, typically used by males to attract females and defend a territory (although females also sing in some species, e.g., cardinals).

No bird has true vocal cords. Instead, birds have a syrinx, which, for most of them, is located at the juncture of the trachea (windpipe) and bronchi. The syrinx is composed of soft, stretchy membranes, which can be likened to a drum. Tiny attached muscles vibrate the membranes to create a variety of sound, much like the skin of a drum can be tightened or loosened to vary sound. Songbirds have eight or nine pairs of muscles that pull on these membranes, whereas most other birds have only one or two pairs. Turkey vultures can only produce hissing sounds because they lack a syrinx or voice organ.

Birds can also modify the sounds they produce by changing the pitch, tone, rhythm and volume; they regulate the air forced up from the lungs through the syrinx and vary the tension of the muscles attached to their syringeal membranes. Through the manipulation of air pressure and muscles, the general mechanics of producing sound are similar in birds and humans. However, the location of the sound generator (lower versus high in the throat) and the lack of a resonating chamber in the nasal, throat and mouth cavity allow birds to produce full, rich songs with closed bills, or mouths full of food or nesting material!



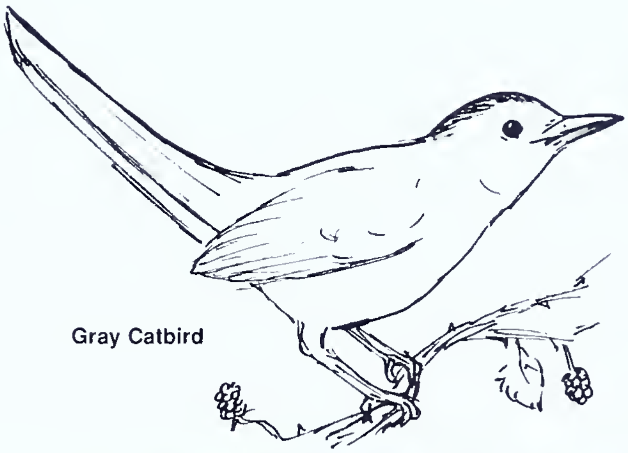
Syrnix

John Wiessinger

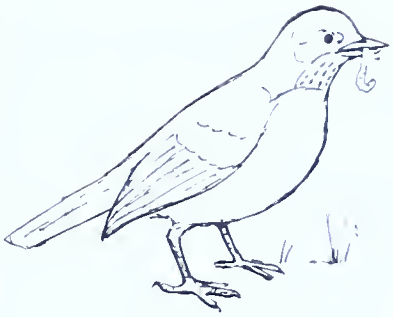
In humans, the nasal cavity affects our voice. Try saying something with and without the nose pinched. Hear the difference? The human tongue changes the sounds as well. The larynx (voice box), lungs and vocal "cords" together create sound. Put fingers against the throat and start talking to feel the vocal "cords" vibrating. Human vocal "cords" are known technically as "vocal folds," which are actually long, smooth, round bands of muscle. In humans, the lips, tongue, cheeks and nasal cavity all affect the quality of the sound produced.

Perhaps the most remarkable and distinct feature of a bird's vocal production is the use of both bronchia, either independently or simultaneously, to produce song. This ability creates the harmonics present in birdsong, and allows them to virtually sing in harmony with themselves.

*See Bibliography for references.*



Gray Catbird



American Robin

### A CLASS OF ITS OWN

The following is the classification of a single species of songbird:

**Kingdom:** *Animalia* (many-celled organisms with no rigid cell wall and cannot make their own food)

**Phylum:** *Chordata* (animals that have a single nerve cord at sometime in their lives)

**Class:** *Aves* (birds, vertebrates that have feathers, lay eggs, and forearms modified as wings)

**Order:** *Passeriformes* (perching birds)

**Suborder:** *Oscines* (songbirds)

**Family:** *Muscicapidae* (This family shares external characteristics such as the upper bill slightly notched near the tip, and the plumage of young birds spotted on the breast)

**Genus:** *Turdus*

**Species:** *migratorius*

**Common Name:** American robin

# Lesson 1

# *Vertebrates Have Class*

**Age:** Grades 3-6

**Subject:** Science

**Skills:** Knowledge, application, classification, comparison and contrast

**Duration:** Minimum of one 45-minute period; could be extended to two

**Group size:** Maximum of 30

**Setting:** Indoors and outdoors

**Key vocabulary:** Closed circulation, warm-blooded, cold-blooded, respiration, fish, amphibian, reptile, bird, mammal, gills, monotreme, marsupial, placental

## OBJECTIVE:

Students will distinguish between the five common classes of vertebrates: amphibians, birds, fish, reptiles and mammals.

## METHOD:

Students compare and contrast pictures of vertebrates. Upon completion, a game reinforces what they have learned.

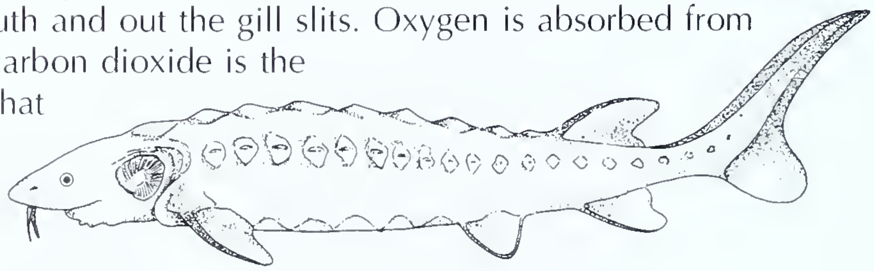
## MATERIALS:

Flip chart, pictures of vertebrates (old calendars and nature magazines are a good source), writing materials, five sturdy (to withstand wear and tear) picture cards—one for each of the five classes of vertebrates.

## BACKGROUND:

All vertebrates have a backbone, a skull or cranium to enclose and protect the brain, and a spinal cord. Red blood is contained in blood vessels within a closed circulatory system.

Fish have adapted to life in water. Their streamlined bodies are covered with scales, which protect the body. Breathing is accomplished through gills, respiratory organs kept continuously moist by passing water through the mouth and out the gill slits. Oxygen is absorbed from the water, and carbon dioxide is the by-product of that respiration. The heart, a simple pump, pumps blood to the gills only, where it is then fed to the body.

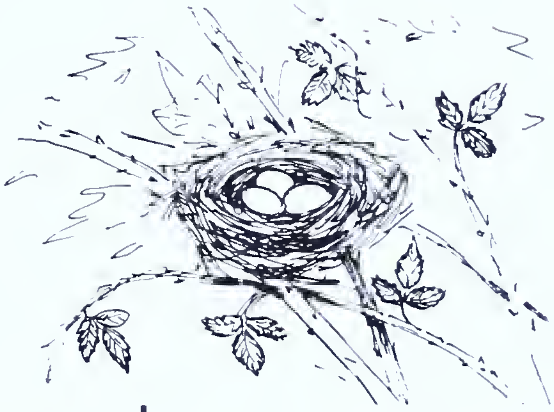


Amphibians include frogs, toads, newts and salamanders. Adapted to land locomotion, amphibians have legs containing five or fewer toes. Respiration is accomplished by means of gaseous exchange through the skin, and for some, through small, inefficient lungs. Two nostrils connect to the mouth, which provide air to the lungs. The right atrium of the heart receives impure blood from the body, while the left atrium receives pure oxygen from the lungs. These two are mixed in the single ventricle. Mixed blood is then sent to the skin for further oxygenation. Amphibians do not necessarily need to return to the water for reproduction, but do require moist areas.

Reptiles include turtles, alligators, snakes and lizards. Reptiles are well adapted to land environment, with scaly skin that prevents the loss of water, and the ability to reproduce through the production of eggs, which may result in live birth or laying of eggs. Well-developed lungs within a rib cage provide oxygen to the heart, which may contain three or four chambers. Reproduction occurs through internal fertilization, in which the penis of the male passes sperm directly to the female. The shelled egg provides the developing embryo with food, oxygen and water, while also removing wastes, such as nitrogen.

Birds are characterized by the presence of feathers, which are actually modified reptilian scales. Birds are adapted for flight, as well as for swimming, running and perching. A four-chambered heart separates oxygenated from unoxygenated blood. Lobular lungs form air sacs throughout the body, including air sacs and the bones. Air circulates one-way through the lungs, both during inspiration and expiration, thereby alleviating the need to "hold" air in the lungs. Birds have well-developed brains and are fully adapted to life on land. Like mammals, they are warm-blooded, able to maintain a constant internal body temperature. All birds lay eggs.

Mammals are characterized by the presence of hair and mammary glands that produce milk for the young. Most mammals are completely adapted to life on land, with limbs that provide full movement, a well-developed brain, lungs that expand through the motion of the rib cage and diaphragm, and a four-chambered heart. Mammals are able to maintain a constant internal temperature. Mammals are classified by the method in which they reproduce: egg laying (monotremes), pouches for the development of the immature embryo (marsupials), and placental mammals.



Gray Catbird Nest

## PROCEDURE:

1. Discuss the definition of a vertebrate, and that all vertebrates are believed to have evolved from an aquatic environment.
2. Provide a flip-chart page or chalkboard column for each class of vertebrate.
3. Show students pictures of the vertebrates, asking them to identify characteristics of the vertebrate *(fur, feathers)*, of the habitat *(land, water)* and what they know about the species (*starts out as a tadpole, lays eggs, cold blooded)*.
4. Review the lists. Develop a master list of similarities and differences with the students' help. What do they have in common? How are they different?

| Characteristics | Fish | Amphibians | Reptiles | Birds | Mammals |
|---|---|---|---|---|---|
| Breathing | gills | exchange through skin | well developed lungs | Lobular lungs w/ airsacs | well developed lungs |
| Heart | simple pump | 3 chambers | 3 or 4 chambers | 4 chambers | 4 chambers |
| Reproduction | | | | | |
| etc. | | | | | |

5. Play a game to reinforce these similarities and differences. Divide the class into two teams and place them about 30 feet apart, facing one another. Assign each member of the team a number, starting with one for each team (so there will be corresponding numbers). Place the vertebrate cards on the floor between the two teams. The goal of the game is to correctly identify the vertebrate class from the clue given (one of the similarities or differences from the master list) and get the card back to home base before being tagged by the other team. For example, if you said "Choose the vertebrates that are warm-blooded," and then called out, "Number 1," the student on each team assigned that number would run out and pick up the bird or mammal card (or both), and try to return to home base without being tagged by the other "Number 1." If he/she is tagged, it's a tie. Don't keep score, so it's non-competitive. Use creative questioning.

Examples of questions:

- What vertebrates have a muscular diaphragm to help them fill their lungs with air? *(mammals)*
- What vertebrates have true flight? *(mammals and birds)*
- What vertebrates do not have teeth? *(birds)*
- These vertebrates breathe only with gills? *(fish)*
- To what class do turtles belong? *(reptiles)*

## EXTENSION:

- Have students design a bulletin board depicting the characteristics of each class of vertebrates.

## EVALUATION:

- Master chart and success of game.

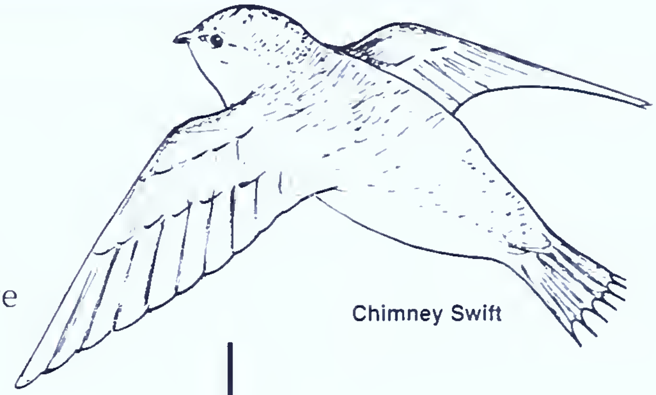
## RECOMMENDED LITERATURE:

Burton, Robert. *Egg, A Photographic Story of Hatching.* New York: Borling Kindersley, 1994.

Adapted with permission from:
*Birds in the Balance.* Randall Davey Nature Center, National Audubon Society.

## Lesson 2

# *Flying With The Birds*


Chimney Swift

## OBJECTIVE:

Students will identify the characteristics by which birds are defined and the adaptations necessary for flight.

## METHOD:

Students become birds through fantasy reading. Students discuss the changes that had to occur in their bodies to become birds.

## MATERIALS:

Reading, *Flight of Fantasy* (provided), seven-foot long pieces of string (one for every two students), *Wingbeat Chart* (provided), clock.

## BACKGROUND:

There are more than 9,000 species of birds in the world, and about 650 of them are found in North America. More than 350 species have been found in Pennsylvania, 187 of which regularly breed in the state.

Birds are characterized by feathers, wings, strong, light skeletons, hollow bones and beaks. They have keen eyesight and hearing, but most have a poor sense of smell. Birds are warm-blooded and lay eggs. (For more details, refer to the Background section of this chapter.)

A bird's structural design has two purposes: to reduce the animal's weight; and to increase power production, enabling flight. The development of flight capabilities allowed birds to access new sources of food and escape from earth-bound predators.

## PROCEDURE:

1. Review the characteristics that separate birds from other vertebrates.
2. Have students sit comfortably on the floor, far enough away from their neighbors that outstretched arms do not touch.
3. Have the students close their eyes and take a few deep breaths. Wait for the squirming to settle, taking additional deep breaths if necessary.

**Age:** Grades K-6

**Subject:** Science, math, language arts

**Skills:** Analysis, application, discussion, writing, comparison and contrast

**Duration:** 45 minutes

**Group size:** Any

**Setting:** Indoors or outdoors

**Key vocabulary:** Adaptation, wingspan

4. Using a soft, relaxing voice, tell the students to let their imaginations soar as *Flight of Fantasy* is read to them.
5. After the reading, have the students imagine that they are eagles. With eyes still closed, have them raise their wings (arms) to the sides, telling them that this is their wingspan. Have students open their eyes. Explain that an eagle's wingspan is about seven feet in length. How do they think their wingspan compares to that of an eagle? With a partner, use the seven-foot lengths of string to measure wingspan. Do any of them have a seven-foot wingspan? How many students does it take standing fingertip to fingertip to make seven feet? Explain that some birds have even larger wingspans, such as the albatross, which has a twelve-foot wingspan. How many students does it take to make an albatross?
6. Ask the students what changes had to occur to their bodies in order for them to become a bird. What functions did these changes serve? Are all birds' adaptations the same? (For example, do all birds have the same kind of beak?)

**Wingspans**

- Albatross 12 ft.
- Eagle 6 1/2 – 7 ft.
- Hawk 2 – 4 1/2 ft.
- Mourning Dove 17 – 19 inches
- Cardinal 10 – 16 inches
- Robin 14 – 16 inches
- Hummingbird 4 1/4 – 5 1/2 inches

**Largest in North America is the California Condor 9 ft. 7"**

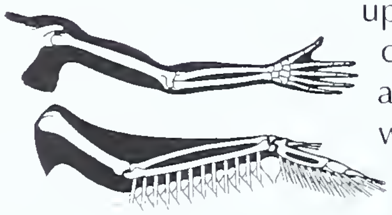
## EXTENSION:

- Have the students write a story that continues where *Flight of Fantasy* ended.
- Have students draw the outline of an albatross' wingspan onto a piece of canvas cloth or large piece of paper. Inside this, place the wingspan of an eagle. The students can then place the wingspan of local songbirds inside that of the eagle's. For fun, have the students trace their wingspan inside the chart.
- Have the students test-fly their new wings. Place the following chart on the board:

**The Wingbeat Chart**

| *Bird* | *Wingbeat/ten seconds* |
|---|---|
| Crow | 20 |
| Robin | 23 |
| Pigeon | 30 |
| Starling | 45 |
| Chickadee | 270 |
| Hummingbird | 700 |

Explain that a bird's wing is similar to a human arm. Both have an upper arm bone connected to a shoulder, an elbow that connects the upper arm to the forearm and a wrist that connects the forearm to the hand. The upper arm and forearm make up the bird's inner wing; the rest is the bird's hand. Gliding birds have long inner wings, which provide the lift for soaring. Flapping birds have long hands, which act as a propeller.



The Cornell Laboratory of Ornithology

Students should stand, leaning slightly forward, with arms to the side. Take a few slow practice flaps. Assign a timekeeper and counter, and have students fly at a crow's pace. How did it feel? Were they able to do it? Try the robin, pigeon, etc. How do the students' arms feel? Why do they think it is difficult? Explain that our legs are more developed, as they are our primary mode of locomotion, rather than our chest muscles.

- Compare the characteristics that define a bird *(wings, feathers, flight, eggs, migration, feet like birds, beaks or bills, crop, gizzard, nest, sing, colorful, warm blood, hollow bones, oil gland or preen gland, two legs).* Use the following format for each characteristic:
  - Does it occur in all birds?
  - Does this occur in any other mammal?
  - Why do animals do this or have this?

## EVALUATION:

- Name adaptations of birds for flight.
- How do humans differ from birds? How are we the same?
- Describe the bird's wing.

## RECOMMENDED LITERATURE:

Anderson, Lonzo. *Mr. Biddle and the Birds.* New York: Charles Scribner's Sons, 1971.
Baylor, Byrd. *Hawk, I'm Your Brother.* New York: Macmillan Publishing Company, 1976.
Cannon, Janell. *Stellaluna.* New York: Scholastic, Inc., 1993.

Adapted with the permission of the National Wildlife Federation from the "Birds, Birds, Birds!" issue of *NatureScope.*

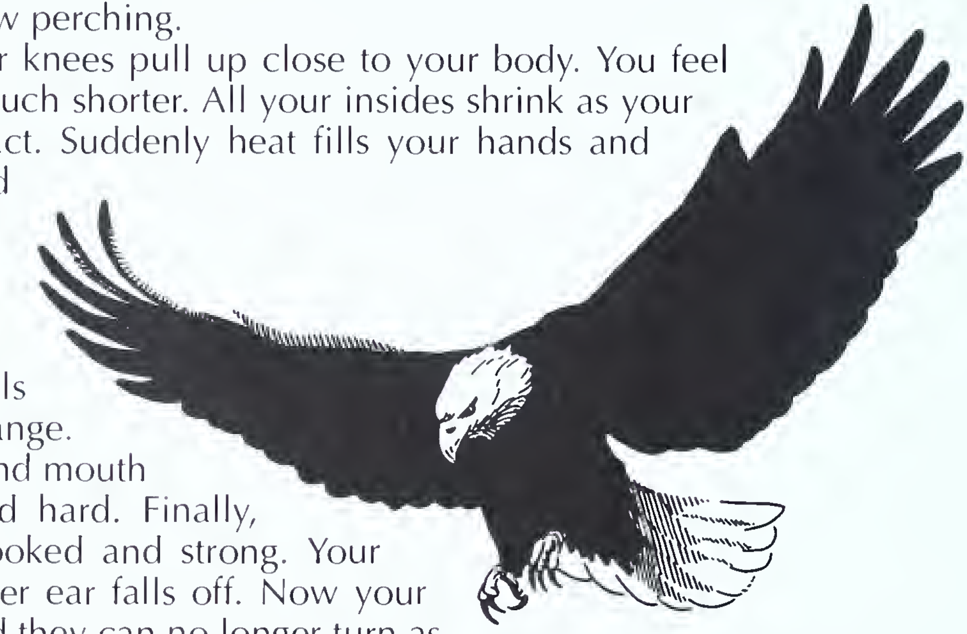
# FLIGHT OF FANTASY

You are going to travel to places you have never been before, moving high above the earth. But to do this, you must first change, for now you are too heavy and would never get off the ground.

Think of your feet and notice how they feel. Wiggle your toes and bend your ankles. Your feet begin to feel warm. Each ankle is getting squeezed and keeps growing until it is long and skinny. One of your toes disappears, and now you have only four. But not all face in the same direction. Three are held in front and one sticks out the back of your foot. The end of each toe has a very sharp, curved toenail. You feel the outside of your feet and ankles change from smooth skin to rough, bumpy scales. There is a perch in front of you and you hop over to it and feel your toes close around it. You are now perching.

Each leg becomes short, and your knees pull up close to your body. You feel your body tip forward and become much shorter. All your insides shrink as your body becomes very slim and compact. Suddenly heat fills your hands and arms. Your fingers almost dissolve and your hands grow very long and flat and wide. Now you have wings. Flap them a few times and feel how they move.

In a flash, your whole head feels warm and everything begins to change. Your teeth disappear and your nose and mouth grow together, getting very long and hard. Finally, they form a sharp, curved beak—hooked and strong. Your chin is gone now, too, and each outer ear falls off. Now your eyes slide to the side of your head and they can no longer turn as easily in their sockets. You have to turn your whole head to look around. The ear holes move close to your eyes, beneath and behind them.



You're changing very quickly now. Each lung changes and air sacs appear in many places in your body. They are like thin balloons connected to your lungs. Air spaces invade your dense bones and make them much, much lighter than they were.

Hair begins to grow all over your body. But wait, they're not hairs! They're feathers--covering you all over, except for your beak and feet. Soft down feathers grow close to your body and longer, wider feathers cover your body, shape your wings and form a broad tail. When you try to speak, only a loud, hoarse call comes out.

A great urge to go outside comes over you. You hop down off your perch and move quickly to the nearest door. As you face outside, the wind calls to you and you jump, flapping your wings quickly and with great force. Up you go—over the trees and buildings and toward the sky. A great, warm gust of wind pushes up under your wings and lifts you higher and higher until the trees look the size of buttons.

A mouse runs across a field far below you. You can see its shape very clearly, even though you are up so high. All of the colors of the earth look beautiful down below—green leaves, brown earth and blue water. Buildings and cars of all colors are connected with roads that look like thin lines.

As you circle on the rising winds, the breeze rushes around your body. You see a puffy, white cloud ahead, and with a few flaps of your wings and a tilt of your tail, you glide into the whiteness. It is cool and damp; you feel lost for a moment. Then you come out on the other side and see a great range of mountains on the horizon.

The mountains and sky are your new home. As you fly high above the earth, you let out a long, loud cry. You are now called Eagle.

# Lesson 3

# *Feathers*

Flight Feather

Contour Feather

Down Feather

**Age:** Grades 3-12

**Subjects:** Science, art

**Skills:** Generalizing, sorting, comparison and contrast, predicting

**Duration:** 45 minutes

**Group size:** Any

**Setting:** Indoors

**Key vocabulary:** Vane, shaft, barb, barbules, contour feather, down feather, uropygial gland, flight feather, feather tract, keratin, follicle

## OBJECTIVE:

Students will name the parts of a feather, compare the structure of different types and predict the functions of different kinds of feathers.

## METHOD:

Students examine several types of feathers.

## MATERIALS:

*Feather Data Sheet,* feathers[*], magnifying glasses, microscopes, overhead projector, rulers, VELCRO™ strips.

## BACKGROUND:

Feathers, an adaptation of reptilian scales, can be found only on birds. Feathers range in size from 1/20th of an inch on a bird's eyelid to five-foot tail feathers on a male peacock. Feathers typically comprise 15 to 20 percent of the entire weight of the bird, and range in number from 1,000 to 25,000. Feathers perform a variety of functions, such as flight, regulation of body temperature, protection, color, attraction of mates and differentiation of species.

There are three main types of feathers. The contour feather is a smooth feather, colored and patterned to contribute to the bird's appearance. The flight feather (a subset of the contour feather) has a hollow, central tube, known as a shaft, running the length of the feather, and a broad, flat vane on either side. The vanes consist of a network of barbs (resembling skinny hairs coming off the shaft) and barbules, small hooks that "seal" the feather like a "zip-lock" bag. Down feathers have a very short shaft and non-interlocking barbs to create dead air space for insulation.

Feathers do not grow evenly on the body. Rather, they sprout from areas of the skin called feather tracts. The feather, composed of keratin (the basis for hair and scales as well), emerges from a tiny growth pit in the skin called a follicle.

---

[*] Since many wild birds and bird parts are protected under the Federal Migratory Bird Treaty Act, it is illegal to gather feathers. Feathers can be purchased at craft stores or poultry farms.

## PROCEDURE:

1. Divide the students into pairs. Give each pair a down feather, a contour feather and a magnifying glass. Allow the students a few minutes to examine the feather.
2. Ask the students to name characteristics of each feather. List these on the board. How are the feathers similar? Different? What functions do the feathers provide?
3. Using the student answers and the background information, explain the different types of feathers and feather parts. Place a feather on an overhead projector to show each part as it is discussed.
4. Explain that barbules work very much like VELCRO™. Pass around pieces of VELCRO™ for the students to examine. Explain that birds preen to keep the VELCRO™ together, thereby keeping their feathers in good flying condition. Have students use hand lenses to examine the VELCRO™.
5. Distribute feather data sheets and new feathers, one to each pair. Have each pair of students complete one sheet.

*Feathers are used not only to fly, but for warmth, hiding, weatherproofing and courtship.*

## EXTENSION:

- Compare various kinds of feathers, such as those from legally harvested birds, such as ducks, turkey, pheasant and woodcock, to those of study skins borrowed from nature centers or agency that holds a permit (such as owls, pigeons and hawks). Compare and contrast these feathers. Why might they be different? (For example, owls have fewer barbules, so that their wing feathers are not held together as tightly. This in turn permits air to filter over the wing, allowing the owl to fly quietly.)
- Conduct an experiment to demonstrate the insulating properties of feathers. Materials needed: two large margarine tubs, two small yogurt containers, down feathers and two cooking thermometers. Place one yogurt container in each margarine tub. Surround one with down feathers, while leaving the other one bare. Pour equal amounts of hot water into each yogurt container. Measure and record the temperature, repeating every five minutes until the water has cooled. Which one cooled more quickly?
- Discuss uses humans have found for feathers. How have these uses benefited or caused problems for birds?
- Collect pictures of birds and notice how feathers shape and color the birds. Notice the color in a variety of settings. How does it change?
- Research and discuss how oiled birds (from an oil spill) are cleaned.
- While mammals have mammary glands, sweat glands and scent glands, birds have only one type of gland in their skin. This is the preen gland or uropygial gland, a conical, bi-lobed structure on the bird's rump. A

*Feathers are made of keratin, the same thing we have in our nails and hair.*

bird squeezes the gland with its beak to extract an oily substance that is then applied to the feathers and feet for waterproofing and moisturizing. This oil also includes a Vitamin D precursor, which is converted to Vitamin D by sunlight and subsequently ingested during the preening act. Cut two pieces of cotton cloth. Apply baby oil to one and leave the other in its natural state. Drop water onto both pieces. Observe what happens. *(The water will soak into the untreated cloth, but bead up or run off the piece treated with oil.)* Baby oil does to the cloth what oil from the uropygial gland does to the feathers.

The longest feather can be found on the Japanese phoenix fowl. It is 35 feet (10.6m) long—longer than three cars lined up behind each other.

## EVALUATION:

- Students will successfully identify their feather type and label their feather. Based upon their knowledge, students will be able to infer the function served by the feather.

## RECOMMENDED LITERATURE:

Elhart, Lois. *Feathers for Lunch.* New York: Harcourt Brace, 1990.
Goldin, Augusta. *Ducks Don't Get Wet.* New York: Thomas Y. Crowell, 1989.
Lasky, Kathryn. *She is Wearing a Dead Bird on Her Head.* New York: Hyperion Books for Children, 1995.
Rupp, Rebecca. *Everything You Never Learned About Birds.* Storey Publishing, 1995.

Adapted with permission from:
*Illinois Birds,* Illinois Department of Natural Resources, Educational Services.
*Hunters of the Sky,* Science Museum of Minnesota.
*Birds in the Balance.* Randall Davey Nature Center, National Audubon Society.

Name ____________________

# FEATHER DATA SHEET

- Draw your feather.

- What is its color?

  ____________________

- What is its shape?

  ____________________

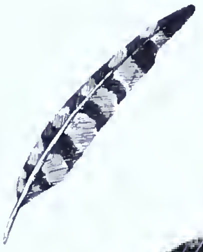
- Does it have a stiff central shaft?

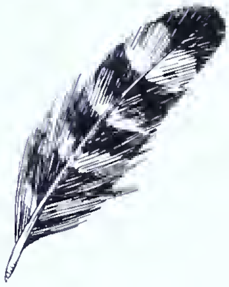
  ____________________

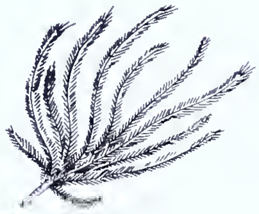
- Can you produce wind when you use it as a fan?

  ____________________

- Circle the type of feather that best represents your feather.







- Measure and record your feather's size:

  Length ________ cm

  Width ________ cm

- Look at a part of your feather under a magnifying glass or microscope. In this circle, draw what you see.

- What do you think your feather might be used for?

  ____________________

  ____________________

  ____________________

  ____________________

  ____________________

- From what bird do you think your feather came? Explain.

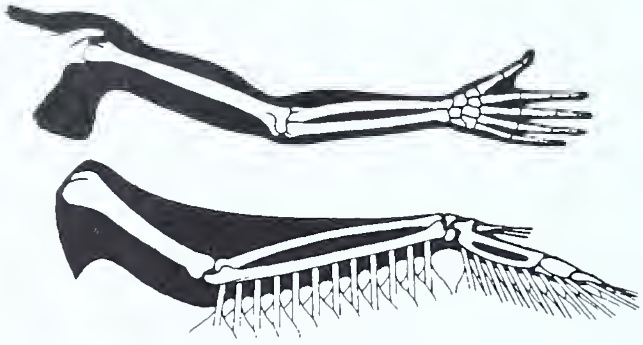
  ____________________

  ____________________

  ____________________

# Lesson 4

# *Bones*



The Cornell Laboratory of Omithology

## OBJECTIVE:

Students will identify the characteristics that differentiate bird bones from those of other vertebrates.

## METHOD:

Students compare bird bones to mammal bones.

## MATERIALS:

Bird and animal bones (available from a butcher), magnifying glasses, saw, scale.

## BACKGROUND:

Most bird bones are pneumatic, or filled with air sacs, to minimize weight and have internal struts (similar to a brace) for strength. Flightless and diving birds, however, have solid bones. As in all vertebrates, bones are necessary to protect and support the fleshy tissue. They must have joints to allow for freedom of movement in many different directions. In birds, however, a rigid skeleton is needed for flight. It must also be organized to shorten the body axis and centralize the weight. All of this is accomplished by the elimination or fusion of many parts that are present in the land-dweller's skeleton.

## PROCEDURE:

1. Divide the students into groups of two. Give each pair a bird and mammal bone of similar size. Have students weigh them. Which bone is heavier?
2. Hold the two bones up to the light. What observations can be made?
3. Cut the mammal bone and bird bone to create a cross-section. (It's helpful if the bones have air-dried several days prior to this activity.) How does the internal structure differ? Have students draw what they find. Label the struts and air space on the bird bone.

**Age:** Grades 3-12 (with modifications)

**Subjects:** Science

**Skills:** Comparison and contrast, predicting, analyzing

**Duration:** 45 minutes

**Group size:** Any

**Setting:** Indoors

**Key vocabulary:** Struts, pneumatic

If you hold a mammal and a bird of approximately the same size, the bird will weigh much less because the bones of most birds are porous; many are filled with air rather than marrow and are connected to the respiratory system.

## EXTENSION:

- Reconstruct a chicken or turkey skeleton and label the parts. How does this skeleton compare to that of a human?
- Why do diving birds and flightless birds have heavier bones? Give examples of these birds.

## EVALUATION:

- Students describe two differences between the bones of birds and other vertebrates.

Adapted with permission from:
*Birds in the Balance*. Randall Davey Nature Center, National Audubon Society.

An adult human has 7 neck vertebrae, while adult swans have 25.

# Lesson 5

# *Vision*

Owl

**Age:** Grades K-6

**Subjects:** Science, physical education

**Skills:** Discussion, observation

**Duration:** 45 minutes

**Group size:** Any

**Setting:** Indoors and outdoors

**Key vocabulary:** Monocular, binocular and peripheral vision

## OBJECTIVE:

Students will compare bird adaptations to those of other animals.

## METHOD:

Students simulate the monocular vision common to most birds.

## MATERIALS:

Chalk, black paper, elastic, balls to catch.

## BACKGROUND:

Most birds can see much better than other animals, including people. They have very large eyes in proportion to their body size, and can focus sharply on both nearby and faraway objects. Unlike many mammals, they can see color. Birds use their keen eyesight to locate food, keep an eye on enemies, spot mates, and find a place to live.

Bird's eyes, usually located on the sides of the head, can focus independently of each other, so that a bird can see two different images at the same time. This is called monocular vision. When they focus straight ahead, birds have binocular vision, with both eyes focusing on the same image. Some birds, like the owls, have binocular vision most of the time because their eyes face forward, just as humans do. (Binocular vision allows an animal to judge distance, making it easier to follow movement. Monocular vision gives an animal a wider field of vision.)

Even though birds can focus each eye independently of the other, their eyes are relatively fixed in their sockets so that they can't roll their eyes around the way we can. Instead, birds have to turn their heads to see different directions. That's why you often see birds twisting and cocking their heads. Some owls can twist their heads more than three-fourths of a full circle!

## PROCEDURE:

1. Draw the outline of a bird's head on the board. Ask where the eyes of most birds are located (*sides, except for some owls, wood ducks and hawks*). Ask for a volunteer to draw the bird's eye.
2. Have each student look at his/her neighbor. Where are human eyes located? Explain that people have binocular vision, which means that they use both eyes at the same time. Most birds have monocular vision, each eye focusing on a different image. Birds only have binocular vision when they focus straight ahead, thus allowing for depth-of-field.
3. Have each student gently cover one eye with a hand and look around. Is there any difference? Cover the other eye. What happens?
4. Discuss peripheral vision. Why might this be important to birds? Why is it important to humans?
5. Demonstrate monocular vision by having each student make a one-eyed mask from black paper and elastic. Take the group outside and have everyone put on an eye patch. Make a large circle and play catch. Is it harder to play with one eye? Why do you think this might be?

## EXTENSION:

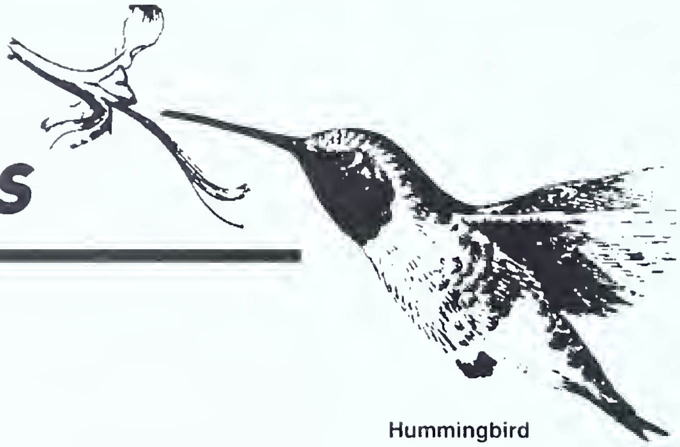
- Compare pictures of various bird species. Where are the eyes located? What type of food do these birds eat? In what kind of habitat do the birds live? Draw conclusions.

## EVALUATION:

- Discuss monocular and binocular vision. Students should be able to differentiate between the two, and list advantages of each.

Adapted with the permission of the National Wildlife Federation from the "Birds, Birds, Birds!" issue of *NatureScope*.

# Lesson 6
# *Beaks & Tongues*


Hummingbird

**Age:** Adaptable

**Subjects:** Science, language arts, math

**Skills:** Discussion, observation, deduction, comparison and contrast, application

**Duration:** Two to three 45-minute class periods

**Group size:** Any

**Setting:** Indoors and outdoors

**Key vocabulary:** Metabolic rate

## OBJECTIVE:

Students will investigate variation in bird beaks and the interrelationships of form and function by classifying birds with similar beaks and inferring possible bird foods based on beak shapes.

## METHOD:

Students compare and contrast the variety of beaks through a simulation exercise.

## MATERIALS:

Part One: Pictures or specimens of birds, *Bird Head* copy page, colored construction paper, string or yarn, glue.

Part Two: Writing material, chalkboard, several large, deep containers (one for every four students), wood shavings, sawdust, fallen leaves, Styrofoam pellets, water to fill the containers to four inches deep (to represent the medium in which bird food might be found), yogurt cups (one per student).

To represent bird food:
- rubber worms or rubber bands, four per student
- rubber or plastic insects, four per student
- marbles or large beads (to represent berries), four per student
- acorns or peanuts in the shell (to represent seeds), four per student
- glass of water

To represent bird bills (one item per every five students):
- one pair of chopsticks (to represent a shorebird's bill)
- one pair of tongs with scalloped spoon ends (duck's bill)
- one pair of tweezers or clothespin (songbird's bill)
- one pair of child's scissors (hawk's or owl's bill)
- one eyedropper (hummingbird's bill)

## BACKGROUND:

The bird world contains an amazing variety of beaks. Beaks are used for eating, defense, feeding young, gathering nesting materials, building nests, preening, scratching, courting and attacking. The shape and size of each species' bill is specific for the type of food it gathers. Cardinals and sparrows have heavy thick bills used to crack seeds. Meat-eaters, like the eagle, have sharp, hooked bills to tear flesh. Robins and other birds with a varied diet have a bill shape that allows them to eat a variety of foods such as worms and fruit. The woodcock has a prehensile tip on its bill adapted for grasping. This allows it to probe the soil and grab earthworms.

Birds use their tongues for a variety of functions. Not only are tongues used to drink, but also to hold, pierce and tear food. Since birds consume great amounts of food, they have a crop in which to store food until it is transferred to the gizzard. Small stones and grit picked up with food remain in the gizzard, where they aid digestion.

Birds have a high metabolic rate, and to survive, must eat large quantities of food frequently. Small birds eat large amounts of food in proportion to their size. Hummingbirds must eat twice their weight daily, while perching birds consume 10 to 30 percent of their weight each day. Most birds must continually search for food. Only a few birds, such as owls, crows and nuthatches, store food for future use.

Great Horned Owl

## PROCEDURE:

**Part One:**

1. Make enough copies of the bird head drawings to allow one drawing per student. Cut out bird heads and labels. Do not permit students to see the labels or the grouping of the illustrations.
2. Distribute the illustrations. Ask students to: mount the drawings on colored paper; measure and cut a piece of yarn long enough to go over their heads; and attach the yarn to the paper, and place around neck.
3. Review bird adaptations discussed in prior lessons. Recall the eagle bill in *Flight of Fantasy* (Chapter 1, Lesson 2). Encourage the class to make inferences from beak shape about the foods a bird eats, and about ways in which birds can be classified into groups according to beak characteristics.
4. Have students study their bird heads. They should then be directed to form a group with other students whose bird heads have similar bills. Discuss with each group its logic for forming.
5. Have student groups determine the food items their groups of birds would eat, based upon shared bill characteristics. In what habitats might those food items be found? Do their birds have any other adaptations that enable them to eat that food (long legs, talons, etc.)?
6. Lead a discussion, with each group sharing its findings. Conclude by explaining how the bird beaks are grouped and labeled in the master copy of the illustrations.

The woodpecker's tongue has barbs and a spear-like tip with which it extracts insects and grubs from holes and crevices.

**Part Two:**

1. Set up a bird-feeding station for every five students in the group. Each station should have a container of wood shavings or other medium, with about 20 food objects of each type (one glass of water) buried in the medium.
2. Prepare a data chart on a large sheet of paper, listing the five foods across the top and the five bills along the side.
3. Review the information gained from Part One activities.
4. Show the students the bird-feeding stations and tools. Determine as a group what kind of bird's bill each tool represents. Explain that the students are going to represent the different families of birds. Each student will have a "bill" and a "stomach" (cup) to collect food. They will have two minutes to search for food items hidden in the containers. They can use only the "bill" to pick up food items. They can take only one item at a time, and must place it in their "stomach" before trying for another piece.
5. Divide the students into groups of five, and have each group sit on the floor around a container. Give a "stomach" and a "bill" to each student. Start the first round.
6. After two minutes, have the students stop and clean up any wood chips. Students empty their "stomachs" and count each food item collected (or measure amounts of water). Tally the results for the entire group on one chart.
7. Have the students bury all the food and pass their "bills" to the right. Repeat four more times so that each student has the opportunity to try all "bills".
8. Add up the numbers from all four rounds on the chart and discuss the results. Some sample discussion questions include: Which tools can be used to pick up several different foods? Which tools are more specialized? How would it help a bird to be a specialist? A generalist? What if two kinds of birds have bills adapted to eat the same type of food? Imagine a bird whose bill was adapted to sucking nectar from one kind of flower. If that kind of flower disappeared, what might happen? What kind of foods are humans adapted to eating?

## EXTENSION:

**Part One:**

- As a class, create a large chart showing the birds for each group, the beak shape and the types of food eaten.
- Take a hike around the campus or neighborhood, searching for appropriate food sources. Students should take notes on the foods they spot and the quantity. What birds could be found near the school? What birds would not survive? Why?
- During the hike, try to identify local birds that would belong to the same groups. What were the birds doing? Where were they observed?

Part Two:

- Challenge the students to draw or make an imaginary bird that is adapted to eating a food of their choice. Explain the adaptation. (Refer to Chapter 1, Lesson 12.)
- Graph your conclusions.

## EVALUATION:

- Students will draw conclusions about bird bills and food. Students will be able to deduce the food of a bird by observing its bill.

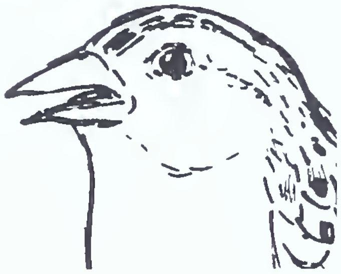
## RECOMMENDED LITERATURE:

Fisher, Aileen. Filling the Bill. Bowmar, 1973. *(Out of print, but sometimes available at libraries)*

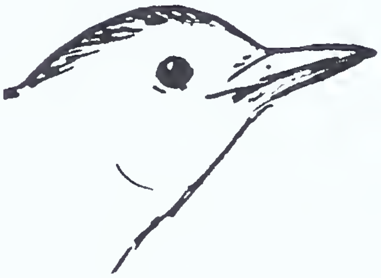
Adapted with permission from:
Birds: *Winter & Year-Round Activities for Children.* Ithaca: Cayuga Nature Center, Inc.
*Your Backyard Classroom.* Virginia State Parks.
The National Wildlife Federation from the "Birds, Birds, Birds!" issue of *NatureScope.*

# BIRD HEADS

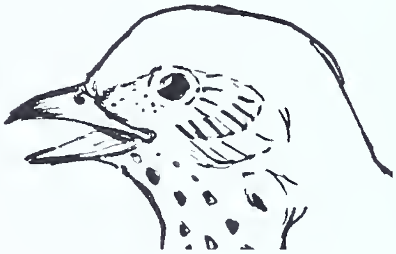
Pincer-like bill for grasping caterpillars, beetles, bugs, and other insects found among the foliage of trees and thickets.



Grasshopper Sparrow

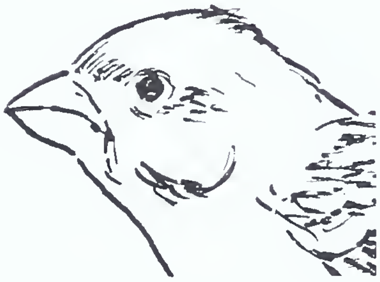


Catbird

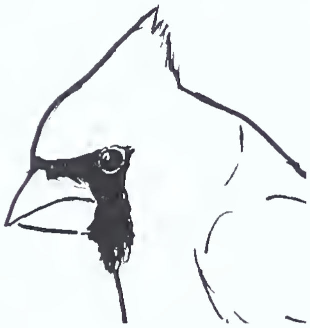


Woodthrush

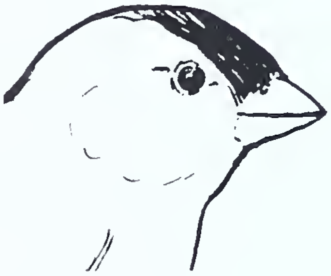
Crushing bill for cracking seeds of many different types of land plants.



Purple Finch

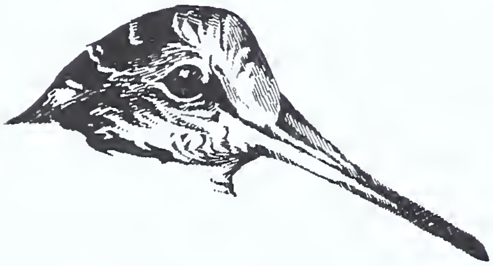


Cardinal

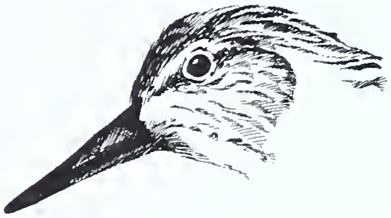


American Goldfinch

Probing bill for poking into mud and soil for worms and crustaceans.



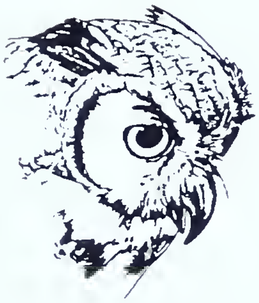
Woodcock



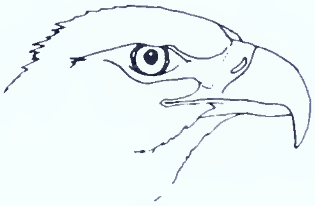
Sandpiper

# BIRD HEADS

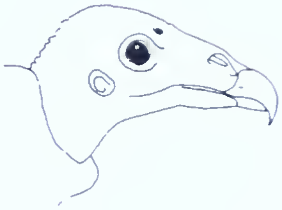
Ripping bill for eating meat of birds, mammals, reptiles and fish.



**Great Horned Owl**

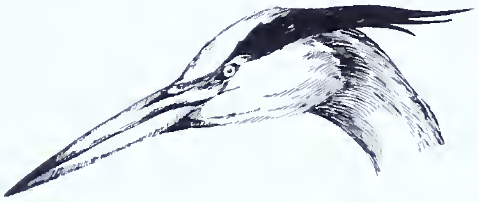


**Hawk**

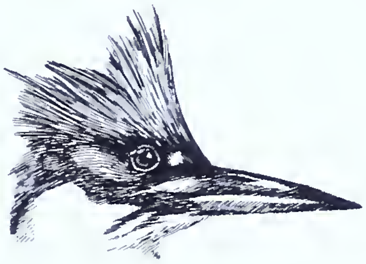


**Vulture**

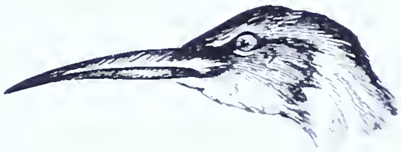
Long grasping bill for catching fish, crustaceans and other aquatic prey.



**Heron**

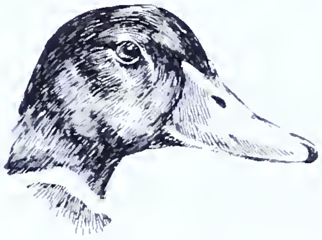


**Kingfisher**

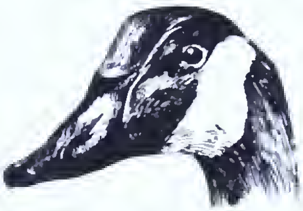


**Egret**

Wide bill for straining seeds, crustaceans and aquatic plants from water and muddy bottoms of waterways.



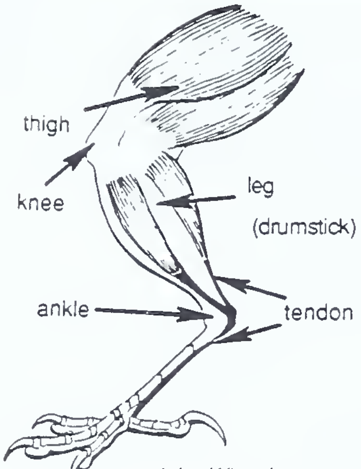
**Mallard Duck**



**Canada Goose**

# Lesson 7

# *Feet Are Neat!*



*John Wiessinger*

**Age:** Grades K-5

**Subjects:** Art, science

**Skills:** Knowledge, inferring, comparison and contrast, application

**Duration:** 45 minutes

**Group size:** Variable

**Setting:** Indoors

**Key vocabulary:** Perch, tendon

## OBJECTIVE:

Students will explain the role of bird feet in bird survival.

## METHOD:

Students study pictures of birds, and draw conclusions about the birds based upon the type of foot.

## MATERIALS:

Pictures or slides of birds/bird feet.

## BACKGROUND:

A bird's "footwear"—its legs and feet—have developed over millions of years to meet the needs of the bird. What most of us consider the leg of a bird is actually its foot, with an elongated instep slanting upwards and backwards to the heel. A bird's knee, which bends forward as ours does, is usually hidden by feathers.

Birds use their feet in many ways, from walking to perching to capturing prey. Most birds have four toes, with the first toe (the hallux) normally facing backward and the other three forward.

Perching birds sleep with their toes locked on a perch. When the bird relaxes in sleep, its body slumps on its feet, causing a tendon that passes behind the heel to tighten. This draws the three forward toes and the hind toe toward each other, clamping the bird to the perch. To release the clamp, the bird simply rises from the slumped position.

## PROCEDURE:

1. Begin by asking the students to draw upon their knowledge of birds by asking a few basic questions:
   - How do birds use their feet? *(Perch, swim, cling to a trunk, walk, dive, capture prey)*

- Can a foot perform more than one function? (For example, ducks can swim and walk, but raptors don't normally swim.)
- How are human feet like bird feet?
- How do they differ?

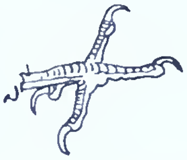
2. Discuss variations in bird foot design. Use magazine pictures or slides, or study skins borrowed from a visitor center or from the Pennsylvania Game Commission. Here are some examples:

**Climbers:** Woodpeckers have two toes in front and two toes in back for climbing up and down tree trunks.
**Graspers:** Hawks, owls, and other birds of prey have large curved claws, called talons, that dig into their prey and help them hold onto it in flight.
**Perchers:** Robins, mourning doves, and many other birds have three toes that face forward and one long hind toe that helps them grip their perches tightly.
**Waders:** Herons and bitterns have three toes in front and one in back, with long stilt-like legs.
**Runners:** Ostriches and killdeer have two and three toes, respectively (instead of four), and all their toes point forward for fast running.
**Scratchers:** Pheasants, chickens and other chicken-like birds have strong toes for scratching in the soil.
**Swimmers:** Ducks, coots, and other swimmers use their feet as paddles.

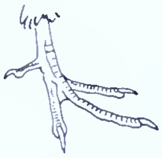
3. Show the students some pictures or slides of bird feet. Have the students explain how the feet would be used. (Examples: Wrens—perching feet; wood ducks—swimming feet; woodpeckers and nuthatches—climbing feet; grouse—scratching feet; herons and egrets—wading feet; hawks—talons for seizing prey.)

## EXTENSIONS:

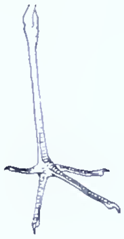
- Challenge students to design an imaginary bird, using the medium of their choice. Have each student explain how his/her bird is adapted for finding a specific food and living a specific lifestyle. (See Chapter 1, Lesson 12, Adaptation Artistry.)
- Give each child a picture of a bird. Spread out pictures of possible habitats or possible foods. Have each child match his/her bird with appropriate food or habitat.
- Make a permanent record of bird footprints. Materials: clear set of prints found in mud or sand, plaster of Paris, a strip of cardboard. Procedure: Place the cardboard around the footprint and clip the ends together to make a ring. Mix plaster of Paris with water, pour into ring, and allow to set. Carefully remove the casting. Label with the date, location, and species of bird.
- Take the students on a bird walk. Have them observe birds with various types of feet and discuss how the different species were using their feet.



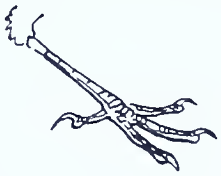
Woodpeckers: Strong toes and large nails for clinging to trees. 2 in front hang on, 2 in back help brace.



Grouse: Strong foot and leg for walking and running.

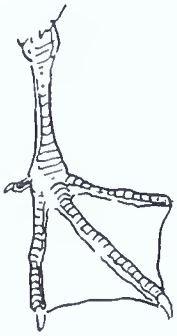


Herons: Long foot and toes for wading also provide large suface area for walking in muddy places.

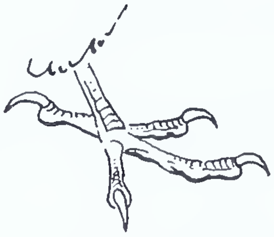


Perching Birds: Rather delicate toes used for grasping branches.

*All drawings by John Wiessinger*


John Wiessinger

Ducks: Webbed toes form paddles for swimming.


John Wiessinger

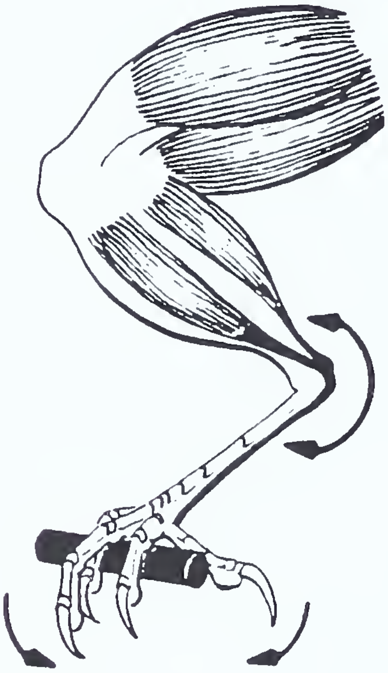
Hawks: Strong toes with large nails (talons) can grasp and hold struggling prey.

The muscles which cause a bird's leg to bend are attached to the toes by tendons which stretch over the ankle. When these muscles contract or when the bird squats, the tendons pull on the base of the toes, causing the toes to curl.

## EVALUATION:

- Students will give examples of bird feet and describe how the feet enable the bird to survive in its habitat.

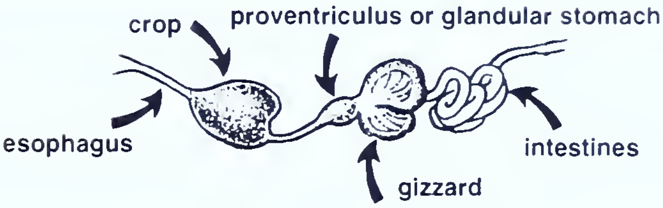
Adapted with the permission of the National Wildlife Federation from the "Birds, Birds, Birds!" issue of *NatureScope*.


John Wiessinger

The more the bird bends its ankle, the tighter the curl. When a bird sleeps, its ankle is bent to its maximum and the toes grip the perch with surprising strength.

# Lesson 8

# *Gizzards*



*John Wiessinger*

## OBJECTIVE:

Students will identify the function of the gizzard.

## METHOD:

Using a mortar and pestle, students demonstrate how a gizzard functions.

## MATERIALS:

Nuts and seeds, pebbles, mortar and pestle.

## BACKGROUND:

Birds do not have teeth, but they do have a muscular, grinding stomach called the gizzard. Many birds also swallow grit (small pebbles, stones, egg shells and other hard material), which ends up in their gizzard and helps grind seeds, bones and other hard-to-digest food.

## PROCEDURE:

1. Place some nuts or seeds, along with a few stones, in a mortar; grind them with a pestle.
2. Pass around the powder; explain that the churning motion used to grind with the pestle is similar to the muscle actions in the gizzard of a seed-eating bird—except that a bird's gizzard is much stronger.
3. Explain that a bird's gizzard helps the bird to maximize the nutrients it can extract from the foods it eats; thereby allowing a bird to derive more energy from less food.

## EXTENSION:

- Examine a gizzard (readily available in store-bought poultry).

**Ages:** Grades K-6

**Subject:** Science

**Skills:** Observation

**Duration:** 20-30 minutes

**Group size:** Varied

**Setting:** Indoors or out

**Key vocabulary:** Gizzard, grit

## EVALUATION:

- Students will recognize the importance of the gizzard to a bird's digestion.

Adapted with the permission of the National Wildlife Federation from the "Birds, Birds, Birds!" issue of *NatureScope*.

# Lesson 9

# Eggs

## OBJECTIVE:

Students will observe the development of bird eggs.

## METHOD:

Students participate in the 4-H embryology project.

## MATERIALS:

Pictures of eggs, 4-H embryology kit, fertile chicken eggs.

## BACKGROUND:

Birds lay hard-shelled eggs made mostly of calcium carbonate. The hard shell keeps an egg from dehydrating and allows parents to sit on the eggs during incubation. Even though the eggs are hard-shelled, microscopic pores allow the transfer of carbon dioxide and oxygen for the growing embryo.

Eggs come in a variety of colors and patterns. Colored or speckled eggs (pie-billed grebe) are laid where camouflage will be needed. Blue or green eggs are laid by birds that nest in shady places (robin). White eggs are laid by birds in cavities (owl). Patterned eggs blend in with grass or small stones and are laid by birds that nest on the ground (killdeer).

The shape of the egg depends on where the bird nests. The most common shape is oval. Birds that lay their eggs on ledges need eggs with a pointed end so eggs will not roll off the ledge (vulture). Round eggs are generally laid by birds in highly secure nests (owl). Birds that lay many eggs typically have eggs that are pointed, allowing incubation of several eggs in a small area (bobwhite). The number of eggs laid varies by species.

The texture of an egg varies from smooth to coarse. Sizes range from the tiny 1/2-inch long egg of Jamaica's verrain hummingbird to the impressive ostrich egg, measuring 5 1/2 inches in diameter. The extinct elephant bird of Madagascar had an egg measuring 13 inches long, with a 9 1/2-inch diameter at its widest part. It weighed 18 pounds and held a gallon of fluid.

**Age:** Adaptable

**Subjects:** Science, math, language arts, art

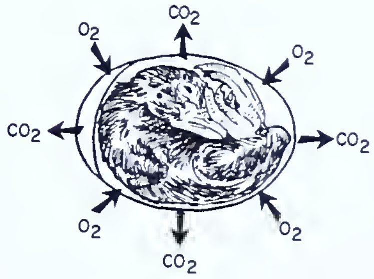
**Skills:** Observation, discussion, application, classification

**Duration:** Several days

**Group size:** 20-25

**Setting:** Indoors

**Key vocabulary:** Calcium carbonate, incubation, camouflage, dehydration, microscopic



John Wiessinger

## PROCEDURE:

1. Introduce eggs by discussing the background information listed above. Are birds the only vertebrates to lay eggs? What other species lay eggs?
2. Have the students choose a species to research. The students should answer the following questions: When does the bird nest? How long is the incubation period? How many eggs are typically laid? What kind of nest does the bird construct? What is the appearance of the egg(s)? Have students share their findings with the class. Invite the students to decorate a hard-boiled chicken egg to resemble their bird's egg.
3. Invite the students to attempt to crush a raw chicken egg in their bare hands. They'll discover it isn't possible because of the shape of the egg. (Caution: With improper handling, this could become a very messy activity.)
4. Break a fresh egg into a clear container and look at the various parts
5. Working in cooperation with the local county extension agency, incubate chicken eggs. Many activities can stem from this.

Ovenbird Nest

## EXTENSIONS:

- Graph the progress of the incubating eggs.
- Show pictures of bird eggs. Have the students guess where the parents might nest (cavity, stones, etc.) If possible, show pictures of eggs laid by diverse species from the same biological family, such as terns, whose members lay eggs of varying size and shape.
- Observe, from afar, an active bird nest. Learn about the bird species that inhabits the nest.

## EVALUATION:

- Summarize the findings of your studies.

## LITERATURE RECOMMENDED:

Burton, Robert. *Egg, A Photographic Story of Hatching.* New York: Borling Kindersley. 1994.

Adapted with permission from:
*Illinois Birds,* Illinois Department of Natural Resources, Educational Services.

# Lesson 10

# *Birds Of A Feather*

## OBJECTIVE:

Students will distinguish the major classifications of birds and their related characteristics.

## METHOD:

Students gain an understanding of the importance of classification by using a "human key," followed by a visual exercise to compare and contrast two different birds.

## MATERIALS:

Activity sheet, *Keying Out Kids* diagram for entire class, pictures of various songbirds, *Birds of a Feather* student page, bird field guides, VENN diagram.

## BACKGROUND:

Carl Linnaeus (lin-A-us), a Swedish botanist of the 18th century, created a system for classifying and naming all living things. Others had tried and failed, but Linnaeus succeeded by categorizing plants and animals in standard ways, according to their biological characteristics (see the songbird background information on taxonomy).

The birds (class: Aves) are generally divided into 28 different orders, based on their similarities and differences. Scientists use keys to classify relationships of birds. Keys list primitive birds first and the more advanced birds, requiring more steps to identify, later in the key. The major orders of birds common to Pennsylvania are listed below in an arrangement from the least to most advanced, evolutionarily speaking. Be sure to note some of the biological characteristics:

### Heron-Like Birds

- Herons, bitterns—Birds in this family are large, fish-eating birds that wade rather than swim.

**Age:** Grades 4-6 (and older)

**Subjects:** Science, language arts

**Skills:** Observation, classification, data collection, writing

**Duration:** 20 minutes for human key section; 20 minutes to key out birds

**Group size:** One or more students, alone or in small groups

**Setting:** Indoors and outdoors

**Key vocabulary:** Classification (including order, family, species) diurnal, nocturnal, syrinx, field guide, key, prey, primitive, characteristics

- Ducks, geese, swans—Birds in this family are common to wet areas and usually have webbed feet for swimming. The eggs of these birds are unspotted.

## Hawk-Like Birds

- Vultures, hawks—Birds in this family are diurnal (day) birds of prey.

## Chicken-Like Birds

- Pheasant, quail, turkey—Birds in this family have very short, rounded wings, are more apt to walk than fly, and are year-round Pennsylvania residents. (Note: Pheasants are a species introduced from Asia.)

## Owls

- Most of the birds in this family are nocturnal (night) birds of prey. Their feathers are modified to allow them to fly quietly. Their eyes are adapted to judge distances.

## Pigeon-Like Birds

- Doves (rock doves, or domestic pigeons)—Birds in this family have been associated with humans for thousands of years and are known for their "homing" ability.
- Cuckoos—Birds in this family have short legs with two toes forward and two back. Their bills are heavy and curved.
- Nighthawks—Birds in this family have weak bills and large mouths. They can feed on flying insects (primarily at dusk and at night, but also by day) by flying through the air open-mouthed.
- Swifts, hummingbirds—Birds in this family are small and have very long, pointed wings. Their feet are small and rarely touch ground.
- Kingfishers—Birds in this family have large bills. Their front three toes are joined at the base. They feed by diving into water to catch fish.
- Woodpeckers—Birds in this family drill into trees for insects. They have two toes pointing forward and two backward.
- Perching birds—Over half of the birds in the world belong to this family. These birds have three toes pointed forward and a fourth pointing to the back and a well-developed syrinx (voice box), which allows for great song variety.

# PROCEDURE:

Part One: "Keying In On People"

1. How do you determine the name of a bird you are looking at, if you have never seen it before? You use a key. A key is a series of questions, each of which asks about a certain feature of a bird, such as the shape of its feet, its bill, or the color of its body. By answering these questions,

you can find the order or family that the bird belongs to and narrow it down from there by using a field guide.

2. Using a "people key" is one way to teach your group what a key is and how it works. The tree-shaped diagram on activity page *Keying Out Kids* is a modified key for identifying people. (Because you already know the name of the person you are keying out when you start the key, this is not a true key. However it will introduce the students to the way a real key works.) Before you get started using the people key, copy the tree-shaped diagram onto a chalkboard or a large piece of easel paper. (You can also make a more permanent display by sketching the diagram on a bulletin board covered with construction paper.)

3. Begin the activity by asking the students how they can tell different people apart. *(By their sex, hair color and texture, eye color, height, and other physical features).* Why isn't clothing a good way to tell people apart? *(People can change their clothes or wear identical clothes.)* Pass out copies of the activity page *Keying Out Kids,* and have the students follow along as you explain how the "key" works.
4. Each of the branches represents a physical feature that helps to tell people apart. By starting at the trunk and moving up the branch that correctly describe the person being "keyed out," you will reach the very tip of an outermost branch. This is the person's position in the key. For example, if you were keying out a blue-eyed girl with straight blonde hair, you would first move up the branch marked "female." At the fork for hair color, you would climb up the branch for blonde hair. After moving up the branch for straight hair and then the branch for blue eyes, you would write that person's name. As an example for the students, try keying out yourself. (If the key doesn't fit the individuals in your group, you can adapt the branches already on the tree or add more specific characteristics.)

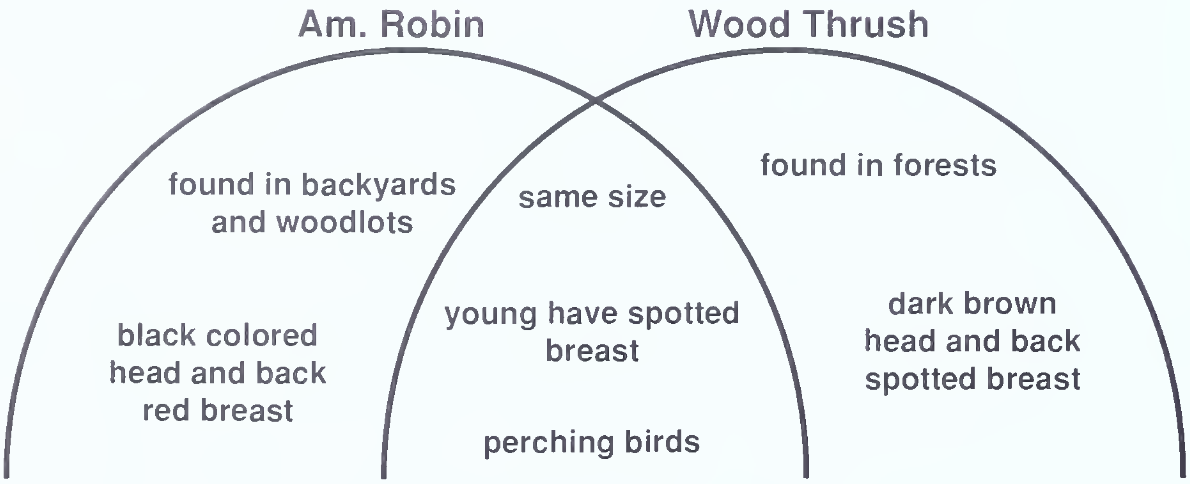
5. Divide the students into pairs. They will work together to key each other out on their diagrams. Carefully looking at their partners, they should go through the key to find each other's position on the key and then write the appropriate names at the ends of the branches.
6. After everyone is finished, have the pairs go up to the large diagram one pair at a time and fill in their names. (If you're making a bulletin board, the students can write their names on index cards or leaf-shaped pieces of construction paper, then tape or staple them on the board.)
7. You may find that more than one person has been placed at a single position on the key. If this happens, call the children to the front of the room. What other characteristics could separate them? (Height, short or long hair, light or dark shade of skin or hair, and so on.)

8. Once everyone's name is on the diagram, go over it as a group. To test the accuracy of your "people key," invite someone into the room who doesn't know the names of the children. Ask one of the children to volunteer, and have the guest "key out" the child to determine his or her name.

### Part Two: What Bird is That?

1. Explain that they can figure out what kind of bird they are looking at by asking some important questions such as: What kind of bill does the bird have? Is it long and pointed, short and wide? What is the placement of its feet and toes? Are there two toes in front and two in the back? Three in the front, one in the back? Are their legs long or short? Is the bird bigger than a crow? Smaller? Where does it live? What kind of sound does it make? Birds are grouped or classified in orders based on their characteristics.
2. Conduct a visual exercise to compare and contrast two birds. Using two, slightly overlapping circles (VENN diagram), note shared features in the overlapping section and unique features of each bird in the remaining portions of the circles (see example #1).
3. Hand out *Birds of a Feather* reference page, field guides, overlapping circle diagram, and pictures of different types of birds. Be sure that major representation comes from the order Passeriformes. Use pictures from *AUDUBON, Ranger Rick,* other magazines and calendars, or the bird flash cards found in the Appendix. Be sure that pictures show the position of feet and bill clearly. Each student or group should compare and contrast two birds.
4. Reference *Birds of a Feather* and have students choose the taxonomic order in which they believe their bird belongs. See if they can find their bird in a field guide. The most "primitive" birds are depicted first in the field guides. Have students note characteristics by answering the previous questions and by writing their observations in the overlapping format shown in Example 1.

## EXAMPLE #1


Am. Robin
Wood Thrush
found in backyards and woodlots
black colored head and back red breast
same size
young have spotted breast
perching birds
found in forests
dark brown head and back spotted breast

## EXTENSION:

- It may be helpful for children to come up with their own classification systems, based on characteristics they can easily observe. For example, birds can be classified by color, size, where they live or what they eat. Just remember that keys consist of opposite statements. A key begins with general characteristics and ends with characteristics that differentiate two similar species. An example for a key classification based on color, size, and habitat for songbirds in Pennsylvania:

1. a. Preferred habitat forests....go to 2
   b. Preferred habitat wetlands...go to 4
2. a. Robin-sized...go to 3
   b. Smaller than a robin...go to 5
3. a. Body all or partly red...*scarlet tanager or cardinal*
   b. Red on other body parts...go to 5
4. a. Red on or under wings...*red-winged blackbird*
   b. No red on or under wings...go to 5
5. a. Red on or under wings....*American redstart*
   b. No red on or under wings and tail...go to.....

- Another method for demonstrating classification would be to arrange several species of songbirds into a family tree (similar to the human key in *Keying Out Kids)* by deciding on characteristics that they have in common. For example: pictures of scarlet tanager, American redstart, red-winged blackbird (all have the color red in common).

## EVALUATION:

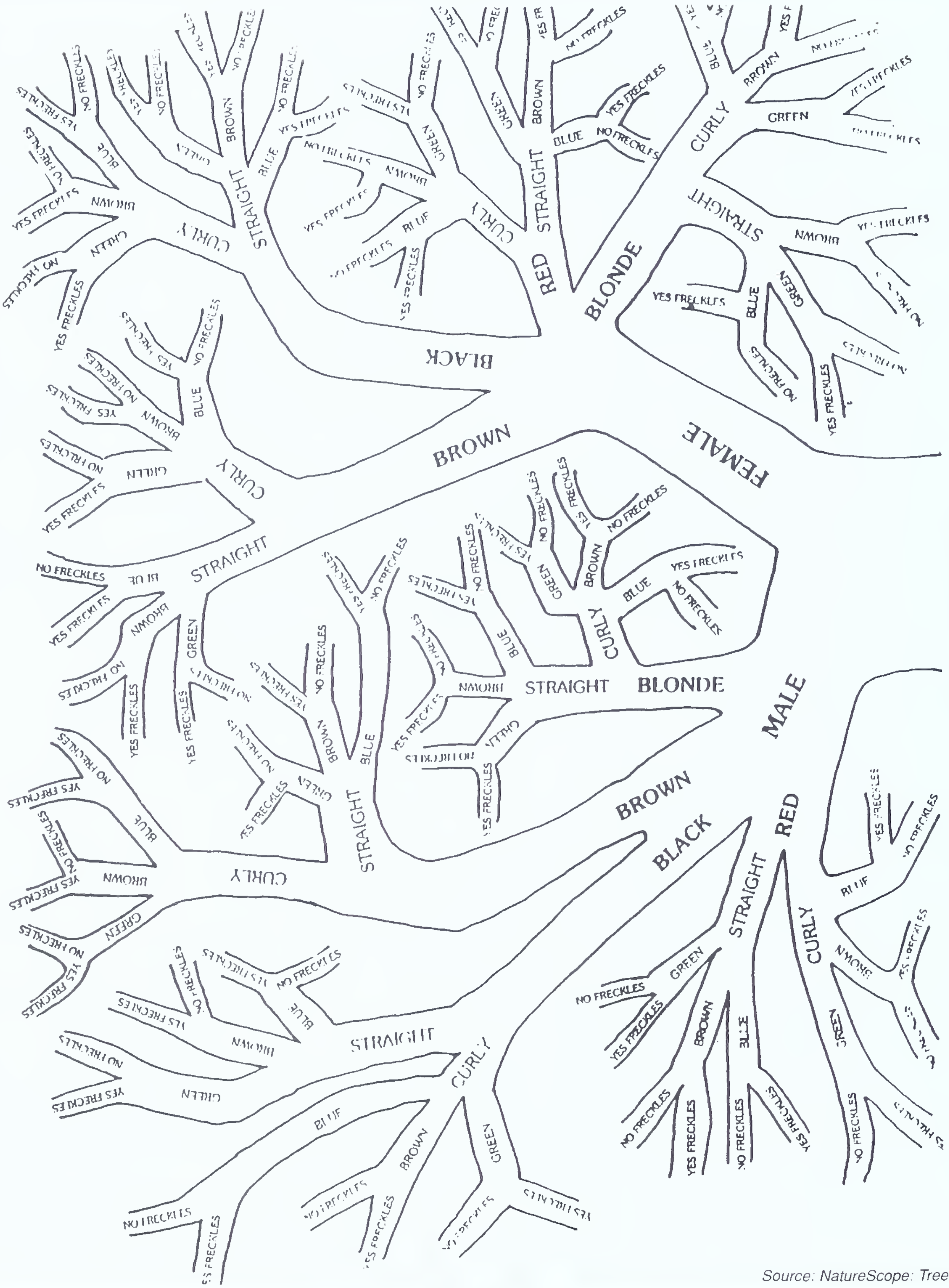
- Have students classify and sort the birds commonly seen on the school ground. Discuss similarities and differences of the birds (such as their habitat needs and how they obtain food).
- Have students make an index card showing the order, family, genus and species of a common local bird. Combine cards as a class reference. Have them cut out a color magazine picture to add to their card.
- Add this information to a classroom family bird tree to help students see relationships of the species to each other. One tree may represent birds found in a wetland, another a forest, etc.

## RECOMMENDED LITERATURE:

Schultz, Ellen. *I Can Read About Birds*. Troll Associates, 1996.

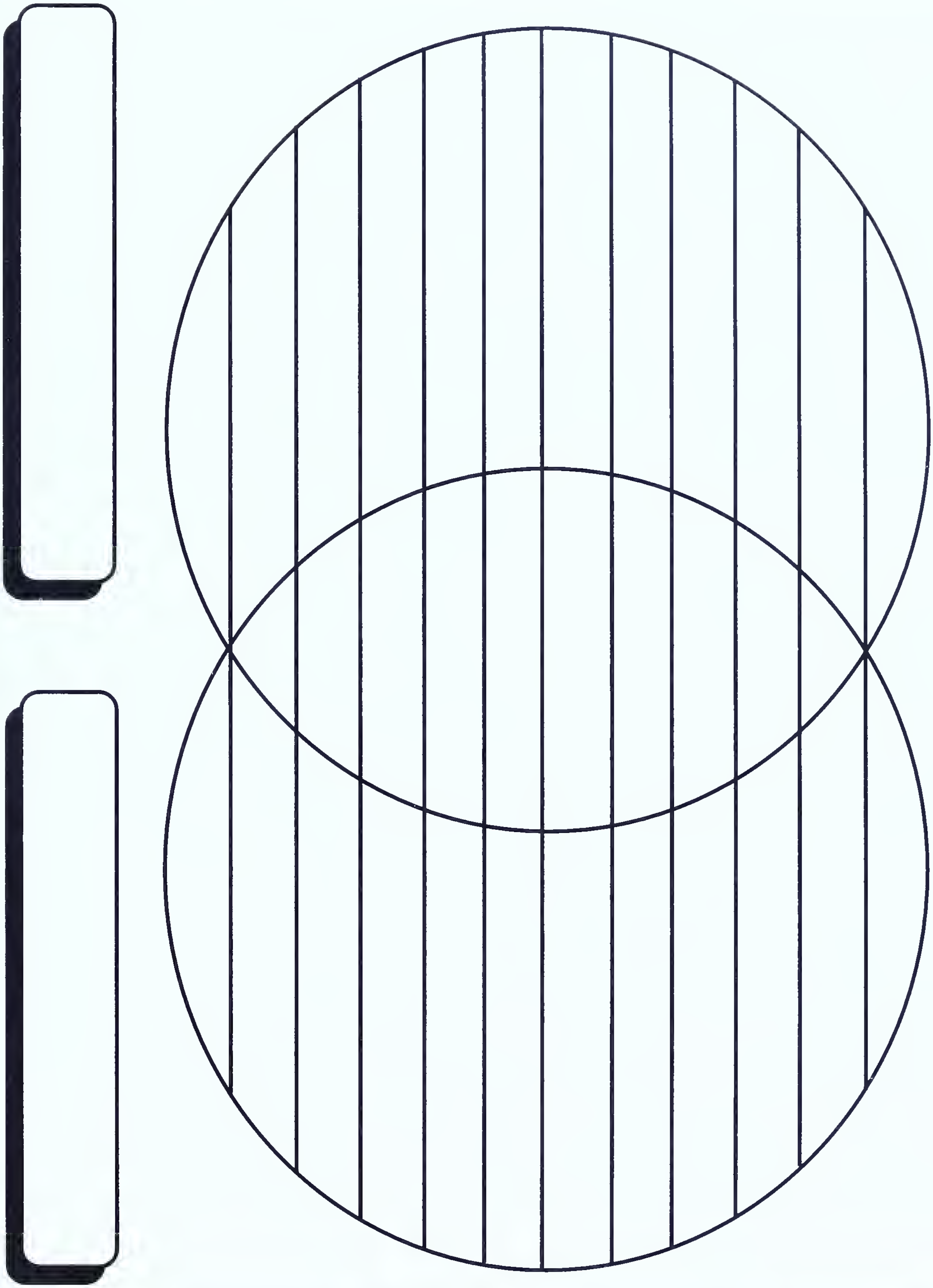
Adapted with permission from:
*Illinois Birds,* Illinois Department of Natural Resources, Educational Services.
The National Wildlife Federation from the "Trees are Terrific" issue of *NatureScope.*

# Keying Out Kids



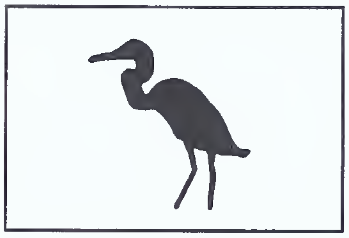
*Source: NatureScope: Trees are Terrific*

# VENN Diagram

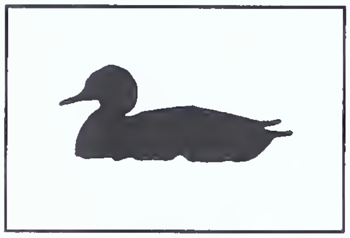


## Birds of a feather—*Student Page*

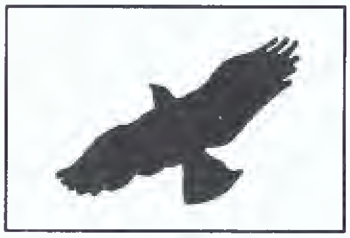
Birds that have similar characteristics are placed in categories as a "family." Scientists use keys to classify relationships of birds. The major families of birds common to Pennsylvania are listed below.



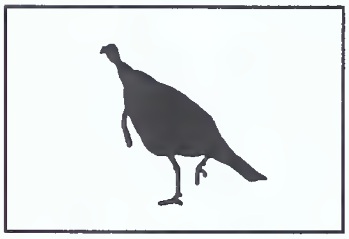
Herons – large fish-eating birds that wade rather than swim



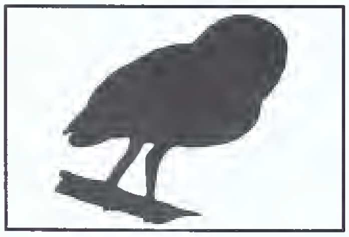
Ducks and geese – birds of wet areas that usually have webbed feet



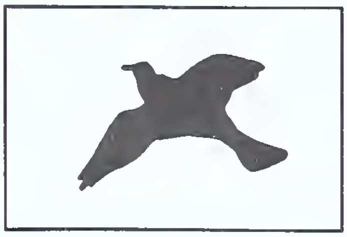
Hawk-like birds – diurnal (day) birds of prey



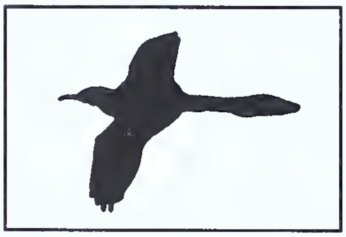
Chicken-like birds – Pheasants and turkeys birds with short, rounded wings that prefer to walk rather than fly



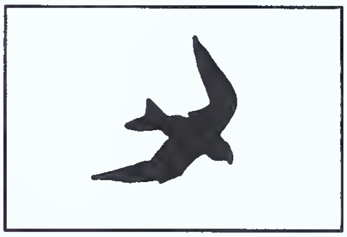
Owls – nocturnal (night) birds of prey



Pigeon-like birds – Doves - associated with humans for thousands of years and known for their "homing" ability

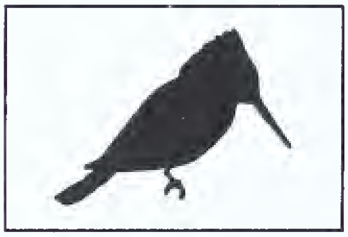


Cuckoos – birds with heavy, curved bills

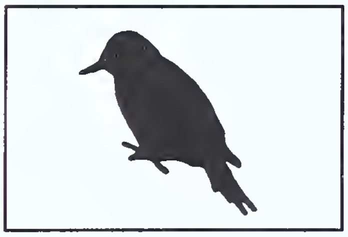


Nighthawks – birds that feed at night by sweeping insects out of the air as they fly

Hummingbirds & Swifts — small birds with very long, pointed wings



Kingfishers – birds with large bills that feed by diving into water for fish



Woodpeckers – birds that drill into trees for insects and have two toes pointing forward and two backward

Perching birds – Over half of all birds belong to this family. They have a well-developed syrinx (voice box) which allows for a great variety of songs.

# Lesson 11

# Birds And Worms

## OBJECTIVES:

Students will simulate how predators use their vision to find prey; describe some different ways animals use camouflage; and invent a fictional animal that is camouflaged for its particular environment.

## METHOD:

Students discover the value of protective coloration as they pretend to be birds in search of colored worms or bugs.

## MATERIALS:

Sixty small objects (toothpicks, colored popcorn, macaroni, etc.) in assorted colors to represent "bugs" (Choose colors that will blend in with the area in which you will be working, i.e., green for a grassy area, etc. Select at least one color that is bright.), a large piece of white poster paper, crayons, paper and pencils, pictures of camouflaged animals.

## BACKGROUND:

Many animals are "color coordinated" with their surroundings. For example, snowshoe hares and grouse-like birds named ptarmigans (TAR-mee-guns) change from brown in summer to white in winter. A box turtle's dappled shell and a fawn's white spots mimic blotches of sunlight on the forest floor. And the two-toned appearance of many fish, dark on top and light on bottom, helps them match differing levels of light in the water. When viewed from above, the darker top blends in with the waters underneath. Any coloration, body shape, or behavior that helps an animal hide is called camouflage.

The use of color for camouflage is important to discussion of bird plumage. In some species the parent that tends the eggs and the chicks is more brown or more plainly colored than the other parent. Harder to see, the egg/chick-tending parent is better protected in the role of major caretaker of eggs and young. The colorful male scarlet tanagers and male

**Age:** Grades K-6

**Subjects:** Science, math, physical education

**Skills:** Determining cause and effects, analyzing, identifying relationships and patterns, predicting

**Duration:** Preparation—30 minutes; activity—45 minutes

**Group size:** Four and up

**Setting:** Indoors and outdoors

**Key vocabulary:** Camouflage, adaptation mallard ducks, for example, do not approach the nest at all. In some species, such as phalaropes, it is the male which is the predominant caretaker, while the female is larger and more colorful.

Birds that make their nests or live mostly on the ground are good examples of the use of camouflage. Look at illustrations of pheasants, quail, whippoorwills, sandpipers, and ovenbirds. None are solid brown in color, but are splotched or streaked with a range of brown hues. The uneven coloring tends to trick the eye; at a glance, the body of the bird blends into the background of leaves or pebbles.

Blending in with the environment is a great way to avoid being eaten, but it's not an adaptation limited to prey animals. Many predators are also camouflaged: the better to avoid being spotted by a potential meal.

## PROCEDURE:

1. Assemble 60 small, colored objects consisting of equal amounts of at least three colors. Try to use readily biodegradable objects in outdoor settings. You'll need 20 each of three colors, or 15 each of four colors, or 12 each of five colors, and so forth. If you use food items, remind students not to eat them. Those items represent "worms" or "bugs." Remember to choose colors that will blend in with the activity area.
2. To play the game, find one or more large, open areas (indoors or outdoors) over which to scatter the worms or bugs.
3. Make sure there is at least one color that matches the playing surface (e.g., gray for asphalt, green for grass).
4. Scatter the worms or bugs (when students aren't looking) throughout the area.
5. Ask the class to think about advantages that bullfrogs have because they're green, and that polar bears have because they're white. Introduce the concept of camouflage and ask if they've heard of it. Have them give examples of how camouflage helps both predators and prey.
6. Divide the group into two to four teams with the same number of students in each team. Take everyone outside to the area where the worms or bugs are hidden. Tell students that various types of tasty food are scattered here and that the students are hungry birds. Describe to them what the worms or bugs look like. Ask them to predict what color worm or bug might have the best camouflage for this environment.
7. Arrange the teams in relay-race lines. Explain that the object of the race is to be the first team to get every bird fed. When you say "Go," the first "bird" in each line should "fly" over the prescribed area and pick up the first worm or bug he or she sees. Each bird flies immediately back to the line and tags the next bird, who does the same thing. When the last bird returns, everyone on the team sits down. The first team to be seated wins.
8. When all teams have completed the relay, spread a large piece of paper (at least poster size) on the ground. Make a chart with as many

columns as there are students on each team. Each column will represent the student's position in line. Each student places his/her worm or bug in the column that corresponds with his/her position in line.

9. Have students record which color worms or bugs were found in each round. Is there any pattern to the order in which the worms or bugs were found? Does this pattern have any significance?
10. Have students take back their worms or bugs. Turn the paper over and make columns that correspond to the different colors. Have students place their worms or bugs in the appropriate color column. Have each student record the number of each color. Which color was hardest to find? What type of worm or bug has the best camouflage for this environment, and why?
11. Have the teams line up again and repeat the game to find the remaining worms or bugs. Afterward, record the results in the same two ways as before; discuss the results.
12. Before leaving the game area, make sure students have recovered all of the worms or bugs.
13. Back in the classroom, have students help you record the data from both rounds in tables drawn on a chalkboard. Older students can create bar graphs to represent the information. Help students interpret the graphs.

## EXTENSION:

- Repeat this activity in a different environment that has predominately different colors. If your first game was on grass, try asphalt, or vice-versa. Discuss how the results differed and give reasons.
- Have students use assorted art supplies to create make-believe "camouflaged" creatures. Have students suggest the advantages of their creature's camouflage and the environment that suits it best.
- This activity can be used as an ambulator from school to activity stations. Explain to the participants that you are going to play a game. While you are walking down a trail, you will pretend to be a predator such as a red-tailed hawk. The other members of the group are mice. Explain that you will call out "camouflage" and count to five. The mice have to become camouflaged by the time you count to five or they will be eaten. At the count of five, turn around and see who you can catch moving! Each time you play the game, give the mice one less second to camouflage. To guide the group in their thinking, ask them, "If an animal wants to be camouflaged, is it more important to be still, or to have the right colors?" Explain that you don't want any answers out loud--this question is just to think about. Each time repeat the question. Sooner or later the group will catch on that all they need to do is freeze! Standing still is very effective camouflage. [Borrowed with permission from *Reaching for Connections,* David Stokes, Schlitz Audubon Center, Milwaukee, WI.]

## EVALUATION:

- To assess how well students understand the concept of camouflage, ask them to give examples of Pennsylvania birds that depend on camouflage. Have them explain how and why the birds benefit from it.

Adapted with permission from:
The Office of Environment and Ecology, Bureau of Curriculum and Academic Services, Pennsylvania Department of Education and the National Project Learning Tree Program, Washington, DC.

# Lesson 12

# *Adaptation Artistry*

## OBJECTIVES:

Students will identify and describe the advantages of bird adaptations; and evaluate the importance of adaptations to birds.

## METHOD:

Students design and create imaginary birds, and write reports including descriptions of the birds' adaptations. Best done after several lead-up activities on adaptations.

## MATERIALS:

Drawing, painting, clay sculpture or papier-mâché materials, construction paper, glue, pencil and paper.

## BACKGROUND:

Birds have a variety of adaptations, including characteristics of beaks, feet, legs, wings and coloration. These adaptations have evolved so that the bird is better suited to its environment and lifestyle. A variety of major adaptations are listed on the next page.

## PROCEDURE:

1. Discuss with the students the various adaptations given the background section of this activity, listing the charts on a chalkboard for reference by the students. Brainstorm a list of bird characteristics, name the birds with such characteristics, and describe the advantage of the adaptation represented by the characteristic.
2. Tell the students they will each have a chance to design their own original bird—one well adapted to its habitat. Each student should decide: where the bird will live; what it will eat; its type of mobility; and its sex.
3. Based on these choices, the students will determine the adaptations that are necessary for their bird, and write them down before proceeding further.

**Age:** Grades 4-9

**Subjects:** Science, art, language arts

**Skills:** Analysis, application of concepts, description, discussion, drawing, invention, media construction, observation, problem solving, reporting, synthesis, writing

**Duration:** One or two 45-minute periods

**Group size:** Any

**Setting:** Indoors (outdoors optional)

**Key vocabulary:** Adaptation

At rest, the ruby-throated hummingbird's heart beats 615 times per minute. The crow's resting heart rate is 342 beats per minute, the turkey's is 93 beats per minute and the resting heart rate of humans is 60 – 100 beats per minute.

4. Using their list of adaptations, each student will create his or her own original bird; for example, by drawing or sculpting it.
5. In conjunction with each drawing or sculpture, each student should write a short report that includes the name of the bird, what it eats, how it gets water, what animal(s) will eat their bird, habitat, and how it

| ADAPTATION | | BIRD | ADVANTAGE |
|---|---|---|---|
| Beaks | pouch-like | pelican | can hold fish, a food source |
| | long, thin | avocet | can probe shallow water and mud for insects, a food source |
| | pointed | woodpecker | can break and probe bark of trees for insects, a food source |
| | curved | hawk | can tear solid tissue, like meat, a food source |
| | short, stout | finches | can crack seeds and nuts, a food source |
| | long, slender | hummingbird | can probe flowers for nectar, a food source |
| Feet | webbed | duck | aids in walking on mud, transportation, swimming |
| | long toes | crane, heron | aids in walking on mud, transportation |
| | clawed | hawk, eagle | can grasp food when hunting prey |
| | grasping | chicken | aids in sitting on branches, roosting, protection |
| Legs | flexor tendons | chicken | aid in perching, grasping |
| | long, powerful | ostrich | aids in running, transportation |
| | long, slender | heron, crane | aids in wading, transportation |
| | powerful muscles | eagle, hawk | aids in lifting, carrying prey, transportation |
| Wings | large | eagle | aids in flying with prey, soaring while hunting |
| Coloration | bright plumage | male birds | attracting in courtship, mating rituals |
| | dull plumage | female birds | aids in camouflage while nesting, protection in shelter |
| | change of plumage with seasons | owl, ptarmigan | provides camouflage protection (brown in summer, white in winter), protection in shelter |

defends itself. Students should also include their lists of adaptations, the reasons for the adaptations, and the advantages provided by the adaptations.

6. Completed projects may either by submitted to the teacher, presented to the class, or displayed in the classroom.
7. Optional: Go outside and identify adaptations on real birds!

## EXTENSION:

- Make mobiles of the completed birds.
- Give the students examples of bird adaptations; have the students explain the reasons for these adaptations.
- Collect pictures of birds to develop a bulletin board showing some of the adaptations discussed. Look for pictures showing bird parts compatible with the "invented" birds. Display the invented birds.

## EVALUATION:

- Name two bird adaptations for each of the following body parts, listing their advantages: beaks, feet, leg, wings and color.

Reprinted with permission from:
Project WILD. *Project WILD K-12 Activity Guide*. Council for Environmental Education. © 1983, 1985, 1992.

# Background

The term habitat refers to the place where an animal lives. Every animal has a specific habitat. For example, the cardinal can live in backyards, parks and forest edges, while chimney swifts frequent urban areas. Habitat has four components—food, water, shelter and space. These components must be available in the proper arrangement and within an accessible distance. The amount and quality of the components determines which animals can live in a given area. Bluebirds live in fields and farmlands, eat insects and nest in cavities. However, if food is available but is not within easy access of a tree cavity, a bluebird may not live in that field or farm area.

Some animals can live close to each other, while others require more space. In either case, if they become too crowded, problems arise as a result of competition and disease. For all animal populations, habitat must provide an ample amount of properly arranged and good quality food, shelter and water within enough space to prevent excessive crowding. Within the habitat there are horizontal and vertical layers. Each of these layers are used by specific species of birds. The bird's location within the layers can provide a key to identifying it.

Each animal has a role or function within its habitat. This role is often referred to as its ecological niche. For example, a goldfinch eats seeds and in so doing helps disperse the plant species throughout the area. Of course the goldfinch itself may be a source of food for a hungry Cooper's hawk.

The term habitat refers to the place where an animal lives.

## Food

Food provides an animal with the energy needed to carry out its daily functions. Food requirements vary among species and depend on location, age, size, sex and behavior. For example, many young birds eat insects that are high in protein. These same birds, when older, may be able to depend on seeds and berries, which are lower in protein, for their nutritional needs.

The diets of animals may also change with the season of the year. During winter, snow and ice sometimes cover the most nutritious food plants, while in spring and summer these plants may be readily available. Of course, catastrophic weather events, such as floods, tornadoes and droughts, will also affect food availability.

## Water

Water is also critical for wildlife. Water provides shelter and is necessary for food production, bathing and the health of body tissue. Some animals will drink from a water source such as a pond, stream or birdbath, while others are able to obtain all the water they need from their food supply. During drought years, water can become a limiting factor for wildlife. However, too much water can destroy an animal's basic needs such as food sources and shelter areas. A limiting factor is a characteristic of an animal or plant's environment (typically a resource) that regulates population size, or on an individual level, one that determines potential for growth, survival or reproductive success.

## Shelter

An animal's shelter serves many functions. It provides living space, a place to feed, a place to raise and care for young, a place of protection from weather and predators, and a place to rest and sleep. People usually think of shelters as vegetation, but shelter also may be provided by a rock pile, hole in the ground, hill, cliff or tree, chimney, billboard, fence post, house or building. Animals may seek shelter in more than one place, depending on the activity in which they are involved. For example, an evergreen near a feeder may provide a place for nuthatches to store their seeds, while a hollow in a nearby tree may provide shelter for nesting.

A limiting factor is a characteristic of an animal or plant's environment (typically a resource) that regulates population size, or on an individual level, one that determines potential for growth, survival or reproductive success.

## Space

The area within which an animal normally must travel to secure its needs is called its home range. The characteristics of the home range reflect an animal's requirement for space and the arrangement of its other main habitat components.

The size of the home range varies from species to species. Generally, small animals have small home ranges and large animals have large home ranges. Migratory songbirds vary their home range throughout the year. Migratory songbirds may (but don't always) have a small home range in the winter and a larger home range in the breeding season. Inside a home range, an animal may have an area it defends against intruders of the same species and sometimes against other species. This is called a territory, and it is where an animal spends most of its time and often raises its young.

In any habitat, animals cannot tolerate being overcrowded for two primary reasons. First, the quality and quantity of habitat components determine the health and reproductive success of wildlife. Dense wildlife populations must compete for habitat components, such as food or water. This can have adverse effects on reproductive success, rates of death and the basic health of individual animals. Second, a social system within a particular species' population can limit the size of its numbers. Pressures within the social system can limit the number of animals on a home range even if the habitat has enough food, water and shelter for a larger population.

It is important to understand the specific habitat requirements of wildlife so that we can plan and manage our parks, neighborhoods, farms and public lands to best meet the needs of wildlife and people.

# HABITATS OF PENNSYLVANIA

## Mixed Deciduous Forest

A forest is a distinct habitat that thrives in a mild climate with ample water. Pennsylvania is made up of 57% forest habitat (17 million acres). Trees are the dominant species, creating a shaded floor and understory plants adapted to life in the shade. Dominant or canopy tree species typically found in the mixed deciduous forests of Pennsylvania are chestnut oak, red oak, white oak, American beech, red maple, sugar maple, black birch, black gum and tulip poplar. These species are interspersed with small areas of evergreens such as hemlock and pine. Understory and ground cover include a wide variety of species such as mountain laurel, viburnums, dogwood, redbud, sassafras, spicebush, ferns, Virginia creeper and wildflowers. Vast areas of these forest plants provide a safe haven for our interior forest bird species such as the scarlet tanager and wood thrush.

## Forest Edge

An edge is an area where two habitats come together, such as where a forest meets a field. A typical forest edge is a transition zone from forest to shrub area to grassy field. These areas provide a rich diversity of food and shelter sources. Many bird species will nest in trees and use the neighboring field for their source of seeds and insects, e.g., catbird, towhee and woodcock.

## Field

The field habitat is characterized by a variety of grasses such as fescue, orchard grass, timothy, and foxtails, interspersed with wildflowers such as Queen Anne's lace, thistle, goldenrods, ragworts, fleabanes, black-eyed Susan, daisies, wild strawberry, yarrow, and dandelion. These plants thrive in direct sunlight and rather dry soil. Some of these plants are native (found in Pensylvania prior to European settlement) to Pennsylvania, while others, such as Queen Anne's lace, are non-native but very widespread throughout the state. Some bird species that make their home in fields are chipping sparrows and goldfinches. In Pennsylvania, most fields are either maintained as agricultural or are in transition to a forest habitat. Fields are also common in strip mine reclamation areas and landfills.

## Wetlands and Ponds

Wetlands are defined as areas that are regularly wet or flooded and where the water table is at or near the surface for at least part of the year. Areas are designated as wetlands based on vegetation type, soil type and hydrology (presence of water). There are many different types of wetland habitats including forested wetlands, swamps, bogs, vernal ponds and the "typical" cattail marsh. Cattails, grasses, rushes and sedges with very few trees and shrubs characterize a "cattail" wetland. Ponds are small areas of shallow open water. Ponds and wetlands are home to such bird species as the red-winged blackbird, swamp sparrow, marsh wren and many duck species, and provide important food, shelter and water sources for migrants, as well.

## Streams and Rivers

Open and moving water play an important role in songbird habitats. The edges along ponds, rivers and streams are called riparian zones. These areas support plant communities that grow best when their root systems are near the level of high groundwater. These zones range in width from narrow ribbons in mountain settings to wide bands on the plains and lowlands. Riparian zones provide food, shelter, space, shade and a transportation corridor for many species of birds. An example of bird species living in and near these habitats includes tree swallows, veeries, spotted sandpipers and bank swallows.

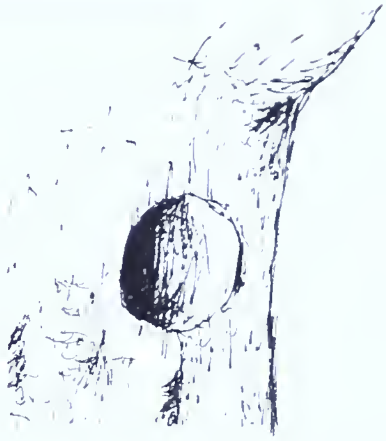
## Neighborhoods

There are many different types of neighborhoods. Some neighborhoods are characterized by a high concentration of people, houses and buildings with small backyards and few trees, providing a limited amount of food and shelter for bird species. These neighborhoods are often found in towns and cities. Bird species found in these areas include robins, starlings, house finches and house sparrows. In other neighborhoods, houses and buildings are surrounded by larger lawn areas, shrubs and trees, which provide food and shelter for a wider variety of birds including cardinals, chickadees, juncos, and mockingbirds as well as those mentioned above. In all neighborhoods birds will make use of houses and buildings for nesting places and shelter. In neighborhoods that are closer to parks and natural areas, the variety of birdlife increases dramatically due to the additional food and cover that is offered by such areas.

*See Bibliography for references.*

# Lesson 1

# *Everybody Needs A Home - Even Birds*



Tufted Titmouse Nest

## OBJECTIVE:

Students will generalize that people and birds share a basic need to have a home.

## METHOD:

Students draw pictures of homes and compare their needs to those of birds.

## MATERIALS:

Drawing paper, crayons or chalk.

## BACKGROUND:

Humans and other animals—including pets, farm animals and wildlife—have some of the same basic needs. Every animal needs a home. But that home is not just a "house" like those in which people live. Home, for many animals, is a much bigger place—and it's usually outdoors. The scientific term for an animal's home is "habitat." An animal's habitat includes food, water, shelter or cover, and space. Because animals need the food, water, shelter and space to be available in a way that meets the animals' needs, we say that these things must be available in a suitable arrangement. Animals, like people, also need clean air for survival.

Homes are not just houses. A house may be considered shelter. People build houses, apartments, trailers, houseboats and other kinds of shelters in which to live. Animals need shelter. The shelter might be underground, in a bush, in the bark of a tree, or in some rocks.

Birds need a place in which to find food and water. They also need enough space in which to live and find the food, water and shelter they need. Everybody needs a home! "Home" is bigger than a "house." Home is more like a community that has everything in it that is needed for survival.

**Age:** Grades K-3

**Subjects:** Science, language arts, art

**Skills:** Analysis, comparison and contrast, discussion, drawing, generalization, visualization

**Duration:** 30 minutes or longer

**Group size:** Any, however, no more than 25 students is recommended

**Setting:** Indoors

**Key vocabulary:** Habitat

## PROCEDURE:

1. Ask students to draw a picture of where they live, or to draw a picture of the place where a person they know lives. Ask the students to include pictures in their drawing of the things they need to live, e.g., a place to cook and keep food, a place to sleep, a community.
2. Once the drawings are finished, have a discussion with the students about what they drew. Ask the students to point out the things they need to live that they included in their drawings. Decorate the classroom with the drawings.
3. Ask the students to close their eyes and imagine: an eagle's home, a woodpecker's home, a pigeon's home, a robin's home, the President's home, their home. Optional: Show the students pictures of different bird homes.
4. Discuss the differences and similarities among the various homes with the students. Talk about the things every animal needs in its home: food, water, shelter and space in which to live, arranged in a way that the animal can survive. Summarize the discussion by emphasizing that although the homes are different, every animal—from people to pets to farm animals and wildlife—needs a home. Talk about the idea that a home is actually bigger than a house. In some ways, it is more like a community. For animals, we can call that community where all the survival needs are met a habitat. People go outside their homes to get food at a store, for example. Birds, ants, beavers and other animals have to go out of their "houses" (places of shelter) to get the things they need to live.

Adapted with permission from:
Project WILD. *Project WILD K-12 Activity Guide*, "Everybody Needs a Home." Council for Environmental Education. © 1983, 1985, 1992.

## EXTENSION:

- Choose two local bird species. Draw their Pennsylvania homes. How do they compare to human homes?
- Build various types of bird nests out of art supplies found in the classroom.
- Discuss the difference between "wants" and "needs" when reviewing the students' drawings; e.g., do they "need" a television for survival, etc.

## EVALUATION:

- Name three reasons why people need homes and three reasons why birds need homes.
- Draw a picture of a suitable habitat for a chosen bird. Write a paragraph to describe how the habitat meets the bird's needs for survival.

## RECOMMENDED LITERATURE:

Cole, Joanna. *The Magic Schoolbus Hops Home.* New York: Scholastic, Inc., 1995.

# Lesson 2
# *Which Bird Goes Where?*

American Goldfinch

## OBJECTIVES:

Students will identify five species of birds and their habitats and generalize that birds have special adaptations that enable them to live where they do.

## METHOD:

Students construct posters of five different bird habitats.

## MATERIALS:

Pictures of five bird species (see flashcards in Appendix), five sheets of butcher paper, construction paper, paper, pencils, scissors, glue.

## BACKGROUND:

Birds inhabit a wide variety of habitat types. Each bird species is adapted for life in its particular habitat type. A red-winged blackbird is adapted for living in wetlands and the goldfinch is adapted for field environments. Their habitats provide all the food, shelter, water and space the bird needs to survive. These components are available to the birds and are in a suitable arrangement (i.e., are readily accessible and in ample supply) to enable the birds to live there. The major purpose of this activity is for students to recognize that all animals, including birds, are adapted for life in different environments.

Following are five suggestions of bird species that can be used for this activity:

**American goldfinch** — Male is bright yellow with black wings. Builds nest of woven plant fibers lined with thistle down in forks of hardwood trees, saplings or shrubs; eats insects as young and seeds as adults. Lives in field habitat.

**Scarlet tanager** — Male is bright red with black wings. Builds saucer-shaped nest out on limb of hardwood trees; eats insects. Lives in forested habitat.

**Age:** Grades K-5

**Subjects:** Science, art

**Skills:** Analysis, application, classification, comparison and contrast, description, discussion, generalization, listing, media construction, observation, psychomotor development, synthesis

**Duration:** 30 minutes

**Group size:** Five groups of three to six students each; increase group size as necessary for class size

**Setting:** Indoors

**Key vocabulary:** Adapt, survive, habitat

**Tree swallow** — Male and female have a dark blue, iridescent black-and-white breast and a forked tail. Nests in cavities, especially bird nest boxes. Lives near wetlands and eats mosquitoes and other insects.
**Cardinal** — Male is bright red with crest of feathers at top of head. Seed-eater. Lives in woodlands, parks, neighborhoods.
**American robin** — Adults are gray/brown on their backs and rusty orange on the breast. Nests, deep cup of mud and grasses, in trees, on rail fences, roof gutters and other human-made structures. Eats worms and berries. Lives in neighborhoods, forests/woodlands.

Tree Swallow

Adapted with permission from:
Project WILD. *Project WILD K-12 Activity Guide*, "What Bear Goes Here." Council for Environmental Education. © 1983, 1985, 1992.

## PROCEDURE:

1. Show the students pictures of five different species of birds (use the silhouettes provided in the Appendix). Ask them to talk about the things that are alike and different about the birds. Have they ever seen these birds? Where?
2. Ask the students to imagine the place where each bird lives. Talk about what is alike and what is different about where the birds live. Think about how each bird looks and whether that helps it to live where it lives. Define adaptation and give examples of adaptations. List adaptations of birds and how they help the birds survive (refer to Chapter 1).
3. Take out five large sheets of butcher paper. Divide the students into five groups and give each group a sheet of butcher paper, and a supply of construction paper, pencils and scissors. Assign a bird to each group.
4. Have each group draw and cut out elements of their bird's habitat (trees, grassy meadows, insects, water, seeds, berries, etc.) and glue these elements onto the butcher paper. Be sure to include a picture or drawing of the bird species. Make sure that examples of all major habitat needs are included: food, water, shelter and space in which to live.
5. Display the finished posters and ask students what they learned about birds and where they live. Discuss how each environment has characteristic life forms, adapted to its climate, kinds of available food, etc. Emphasize that all animals are adapted for survival.

## EXTENSION:

- Have students create habitats for the bird species they developed in Adaptation Artistry (Chapter 1, Lesson 12).

## EVALUATION:

- Describe five kinds of birds, what they need for food, where they live, where they nest and how they look.
- If all the trees were removed from a robin's habitat, would the robin still live there? Why or why not?

## Lesson 3

# Habitat Lap Sit

## OBJECTIVES:

Students will identify the components of habitat; recognize how humans and other animals depend upon habitat; and interpret the significance of loss or change in habitat in terms of people and wildlife.

## METHOD:

Students physically form an interconnected circle to demonstrate components of habitat.

## MATERIALS:

None

## BACKGROUND:

*NOTE*: This activity was inspired by a "New Game," and adapted to teach concepts related to wildlife.

*See Chapter 2, Lesson 1 (Everybody Needs A Home—Even Birds) for an activity with a similar purpose.* People and other animals share some basic needs. Every animal needs a place in which to live. The environment in which an animal lives is called "habitat." An animal's habitat includes food, water, shelter and space in an arrangement appropriate to the animal's needs.

If any of these components of habitat is missing or is affected significantly so that the arrangement for the individual animal or population of animals is no longer suitable, there will be an impact. The impact will not necessarily be catastrophic, but can be. There are a great many additional limiting factors beyond those of suitable food, water, shelter and space. For example, disease, predation, pollution, accidents and climatic conditions are among other factors that can have an impact.

All things are interrelated. When we look at a biological community, we find interrelationships and interdependencies between plants and

**Age:** Grades 4-9 (also younger and older)

**Subjects:** Science, physical education

**Skills:** Discussion, generalization, kinesthetic concept development, small group work

**Duration:** 20 minutes

**Group size:** 15-45 students

**Setting:** Outdoors preferred, indoors possible

**Key vocabulary:** Habitat, shelter, arrangement plants, plants and animals, as well as animals and animals. These interrelationships and interdependencies are important.

The major purpose of this activity is for students to become familiar with the components of habitat, and to recognize that it is not sufficient for there to be food, water, shelter and space in order for animals to survive—those components of habitat must be in a suitable arrangement.

## PROCEDURE:

1. This activity takes very little time—but has a lot of impact! Ask the students to number off from "one" to "four." All the "ones" go to one corner of the room, the "twos" to another, etc.
2. As the students move to their corners, clear a space in the center of the room. Better still, go outside to a clear, grassy area. The "ones" should sit or stand together, "twos" together, etc.
3. Assign each group a habitat component as follows: "ones" = food, "twos" = water, "threes" = shelter, "fours" = space.
4. Now, it's time to form a circle. This is done by building the circle in chains of food, water, shelter and space. A student from each of the four groups walks toward the cleared area. The four students stand next to each other, facing in toward what will be the center of the circle. Four more students—one from each group—join the circle. Keep adding to the circle in sets of four until all the students are in the circle.
5. All students should now be standing shoulder to shoulder, facing the center of the circle.
6. Ask the students to turn toward their right, at the same time taking one step toward the center of the circle. They should be standing close together, with each student looking at the back of the head of the student in front of him or her.
7. Don't panic—this will work! Ask everyone to listen carefully. Students should place their hands on the shoulders of the person in front of them. Students slowly sit down as you count to three. At the point of three, you want the students to sit down—on the knees of the person behind them, keeping their own knees together for support of the person in front of them. You then say "Food, water, shelter and space—in the proper arrangement (represented by the students intact, "lap-sit" circle)—are what is needed to have a suitable (good) habitat."
8. The students at this point may either fall or sit down. When their laughter has subsided, talk with them about the necessary components of suitable habitat for people and wildlife.
9. After the students understand the major point—that food, water, shelter and space are necessary for any animal's survival, and in their proper arrangement comprise a suitable habitat—let the students try the circle activity again! This time ask them to hold their lap sit posture. As the students lap sit—still representing food, water, shelter and space in their appropriate arrangement—identify a student who represents

"water." Then say, "It is a drought year. The water supply is reduced by the drought conditions." At this point, have the student who was identified as representing "water" remove himself or herself from the lap sit circle—and watch the circle collapse, or at least suffer some disruption in arrangement. You could try this in several ways—removing one or more students from the circle. Conditions could vary: pollution of the water supply, urban sprawl limiting availability of all components, soil erosion impacting food and water supplies, etc. Since animals' habitat needs depend upon food, water, shelter and space, in their appropriate arrangement, "removal" of any will have an impact.

10. Ask the students to talk about what the activity means to them. Ask the students to summarize the main ideas they have learned. They could include:
    - food, water, shelter and space, in their appropriate arrangement, can be called habitat
    - humans and other animals depend upon habitat
    - loss of any of these elements of habitat will have an impact on the animals living there
    - the components of habitat must be in an arrangement suitable for the needs of the individual animals or population of animals in order for the animals to survive

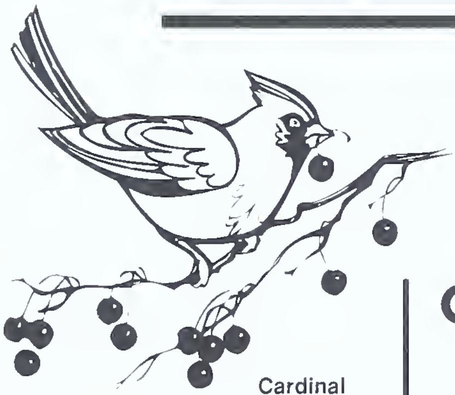
## EVALUATION:

- What are the four essential components of habitat?
- Explain how the arrangement of food, water, shelter and space is important to humans and other animals.
- What would probably have the greater long-term impact on the wildlife living on a farm in Pennsylvania? A severe winter that killed many animals or the development of part of the farm into a commercial shopping center?

Reprinted with permission from:
Project WILD. *Project WILD K-12 Activity Guide.* Council for Environmental Education. © 1983, 1985, 1992.

# Lesson 4

# *Natural Community Profile*



Cardinal

**Age:** Grades 4-6

**Subjects:** Science, art, language arts, math

**Skills:** Mapping, comparison and contrast, drawing, discussion, analysis, surveying

**Duration:** 1 1/2 to two hours

**Group size:** Students work in small groups of three to five

**Setting:** Outdoors

**Key vocabulary:** Community, interaction, interrelationship, survey, dependent, independent

## OBJECTIVES:

Students will list four requirements for life: food, water, shelter and space; define community; state how three plants and animals meet their needs in the forest community; diagram the interrelationships among the plants and animals in the community in which they live; and compare the natural community investigated with the human community where the students live.

## METHOD:

By surveying a natural area, students compare and contrast natural and human communities.

## MATERIALS:

Lapboards, paper, pencils, *Student Data Sheets* (provided), string.

## BACKGROUND:

All organisms require food, water, space and shelter to survive. The plants and animals living together in an area that meets their special needs for energy and nutrients is collectively called a community. All of these plants and animals interact with their surroundings and one another. They are dependent on each other and independent of each other. Human communities are similar to natural communities in that they attempt to meet the special needs of the people living in the community. They are also subject to the same ecological principles that govern natural communities.

## PROCEDURE:

1. What do all plants and animals need to survive? *[We typically discuss four needs (food, water, space and shelter), but remind students that all species, humans included, also depend on clean air for survival.]* Today we are going to find out how plants and animals meet their needs for survival in the forest. To do that we are going to take a survey.

What is a survey? *("a detailed examination, as to ascertain condition,"* Webster's School & Office Dictionary, New York: Random House, 1995).

2. The survey will include finding out which plants and animals live in a part of the forest. First, determine the area of the forest to be surveyed. Choose a central landmark (large rock, stump, tree) for your area. With students, lay out four quadrants around the central landmark. These may be measured with a 10 to 20 foot string, or designate appropriate trees, stumps, rocks, etc., as boundaries to the area.
3. Divide the group into smaller subgroups. Have students make a map or top view sketch of their subgroup's area. On the map they should locate and label the various plants, animals, animal traces and nonliving things (rocks, trails, logs, etc.). You may want to review with students where to look for animals and which animal traces may be in their area. Students should be able to identify animals and plants to family classification. As plants, animals, and nonliving things are mapped and identified, they should be listed on *Student Data Sheet II.*
4. Students then select three of the plants and three of the animals from their areas. Students investigate and record how these plants and animals meet their needs.
5. Regroup students and have each group report its findings. As each group reports, all students should add plants, animals and nonliving things that they do not have on *Student Data Sheet II.* Questions to ask students: How many different plants did you find? Were there more larger plants or more smaller plants? Why? Is there any way we could classify these plants into different groups? *(Canopy, understory, shrubs, groundcover.)* Do you think some of these plants require more air, sunlight, water or food than others? Why? Do you think all the smaller plants will stay the same size they are now? Which ones might grow larger and which ones might stay the same? What might prevent some of these plants from meeting their needs and growing larger?
6. Direct one question about a specific need to each group. After students respond, ask for additional information from other groups. How do plants meet their requirements for space? What happens when plants get too crowded? How are trees protected or sheltered? *(Bark, grow close to other trees that provide windbreaks, grow in valleys or hillsides away from wind, grow thorns, etc.)?* Do all trees meet their needs the same way? How do trees help one another?
7. How many animals or animal signs did you find? Do animals meet their needs the same way as plants? Have several students identify one of the animals they found and how the animal meets its needs. *(Be sure that both carnivorous and herbivorous animals are represented.)* Do the animals depend on the plants? *(Yes. To illustrate pick several animals and trace their relationships to plants back through the food web.)* Do the plants depend on animals? *(Many plants are pollinated by animals. Many animals help to break up plant material for decomposition, and animal wastes serve as fertilizers.)*

8. For discussion: All the plants and animals we found today perform special roles or jobs where they live. (You may want to discuss producers, consumers and decomposers here.) What role does an oak tree play? What role does a honeybee play? How about your favorite plant or animal? What role does it play? Each special role or job a plant or animal plays in the environment is called what? (A *niche*. See Chapter 2, Lesson 6.) Each plant or animal fills a special job or niche that helps the other community members or the community. Where you live many people have jobs that help you and other people. What jobs do people have where you live that help you? *(Trash collectors, carpenters, bakers, grocers, etc.)* People living together and helping one another are called a community. What do you think a group of plants and animals living together and helping one another is called? *(A community is a group of plants and animals living together in an area that meets their special needs for energy and nutrients.)*
9. How do plants and animals living in a community help one another? On *Student Data Sheet II,* draw lines between the plants, the animals and the things they depend on to meet their basic needs. Is there anything that we found that is not related to anything else? Is there anything that helps everything? *(The sun.)* The members of the community depend on and interact with other parts of the community. They are all interrelated.

Each special role or job a plant or animal plays in the environment is called a niche.

10. Is a human community like a natural community? Ask students to look at the maps they drew. The map represents a community all of whose members are interrelated. Now take your map and imagine what each member of this natural community would be if it were a part of the human community. Record on your map what you think it would be. For example, what would deer droppings be? *(Sewage plant.)* What would an oak tree be? *(Grocery store or high-rise apartment.)* Have the students transform their maps.
11. Did you find a role for each part of the natural community in the human community? Which community works better or more efficiently? What do people have to do that members of a natural community do not have to do? *(Human communities import food and water, and export wastes.)* What would we have to do to be more like a natural community? *(Live in smaller communities and take care of more of our basic needs ourselves.)* Do you think we could do that? Why or why not?

## EXTENSION:

- Plan a model community that meets the needs of its members with as few environmental problems as possible. Be sure to meet the community's needs for space, water, food, shelter, clean air and any other needs the students believe are important and necessary.

## EVALUATION:

- Choose ten animals and ten plants living in a natural community of your choice. Diagram the interrelationships among these plants and animals in the community in which they live.

Used with permission from:
Pennsylvania Department of Conservation & Natural Resources, PA Bureau of State Parks. *Activities for Environmental Learning*.

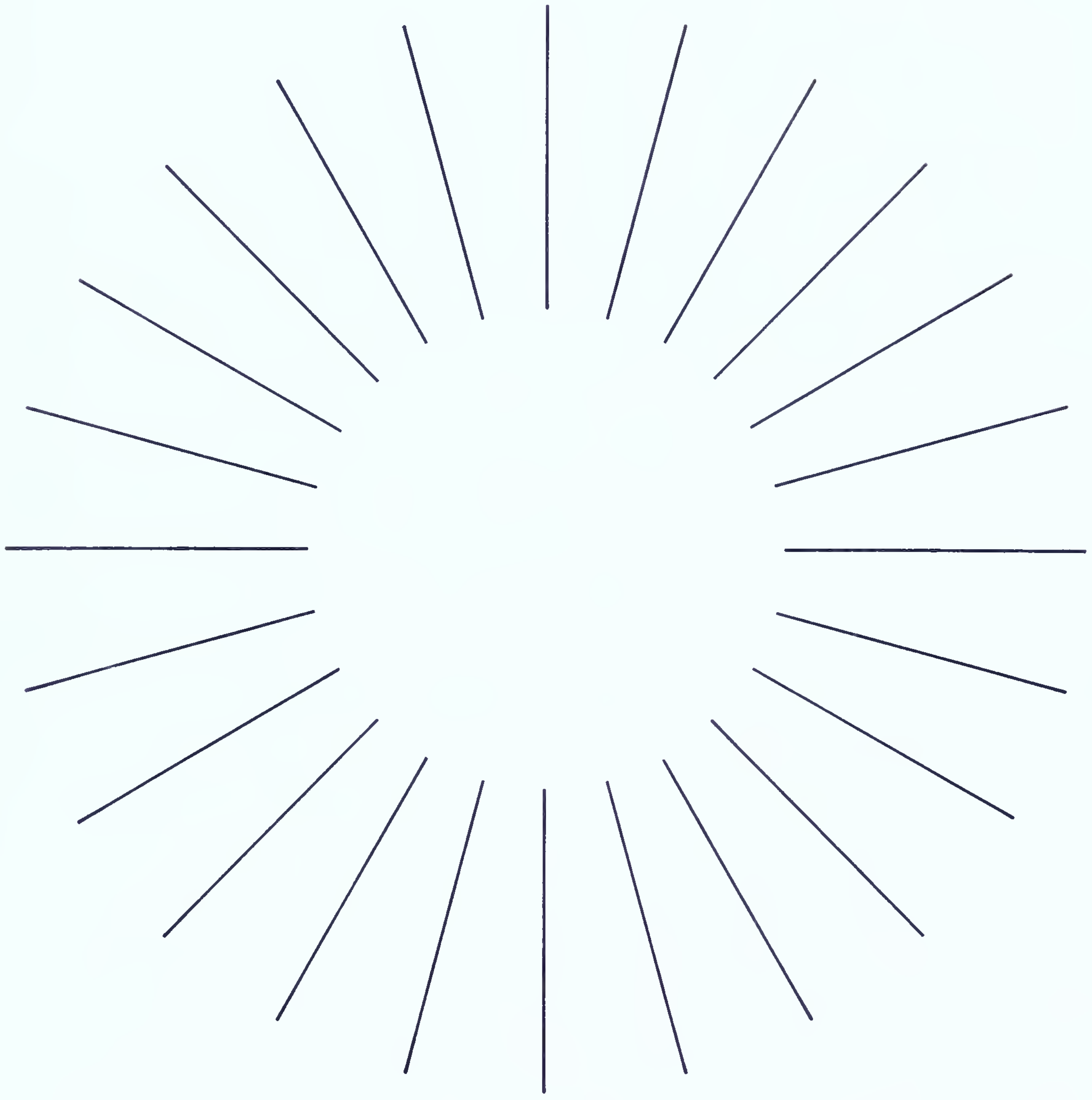
# Natural Community Profile

Student Data Sheet

1 Draw a map of your area. Be sure to include all plants, animals, and nonliving things.

Commonwealth of Pennsylvania
Department of Conservation and Natural Resources
Bureau of State Parks

**2** List all the plants, animals and nonliving things found in your area on the blank lines.



Draw lines between the plants, animals and the things they depend on to meet their basic needs of food, water, air, and shelter.

3 For three animals and three plants that you found in your area, list how each plant or animal meets its basic needs.

| PLANT | Food | Water | Air | Space | Shelter |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| ANIMAL | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

# Lesson 5

# *Shrinking Habitat*

## OBJECTIVES:

Students will describe some effects of human development of land areas on plants and animals previously living in the area; evaluate the importance of suitable habitat for wildlife; and recognize that loss of habitat is generally considered to be the most critical problem facing wildlife today.

## METHOD:

Students simulate a process of land development through a physical activity.

## MATERIALS:

Green and blue construction paper, classroom desks, tables or chairs, five or six large bedsheets or blankets for a student group of about 25.

## BACKGROUND:

All around us, and all over the planet, wildlife habitat is being lost. Whenever an area of land is paved for a shopping center, divided and excavated for homes for people, and sometimes when it is plowed to grow a crop—wild animals and plants lose their homes, and frequently their sources of food and water. As small animals disappear, so to do the larger animals that previously depended upon the smaller animals in the food web as a source of food. Animals that cannot tolerate human intervention may also disappear.

Students can observe this phenomenon near their homes and schools or at least in their region. This process is happening in large and small ecosystems all over the earth.

For example, many wetlands on the planet have been filled and drained to create dry land for farming and homes. When they are filled, many kinds of water birds, reptiles, amphibians, crustaceans and other life forms—including a wide variety of vegetation—are lost. Sometimes the animal forms can move on; most often they cannot.

**Age:** Grades 4-7

**Subjects:** Social studies, science

**Skills:** Application, comparison and contrast, description, discussion, evaluation, generalization, observation

**Duration:** One 45-minute period or longer

**Group size:** Minimum of six students; with one developer, one carnivore, three herbivores, and one tree

**Setting:** Indoors or outdoors, large area with room for people and props

**Key vocabulary:** Habitat, food web, development, herbivores, carnivores, vegetation, consequence

Some of the tropical forests of the planet have become extremely vulnerable in recent years. Scientists estimate that huge numbers of plant and animal forms exist in these forests that have not even been identified yet. They are tremendously important sources of the earth's biological diversity. In fact, some scientists warn us that as these genetic pools are reduced, the flexibility and thus the survival capacity of the remaining plants and animals on earth will ultimately be reduced.

The major purpose of this activity is for students to simulate some of the potential impacts of land development on wildlife and its habitat, to recognize that this process is one that is taking place in areas all over the planet, and to understand that loss of habitat is generally considered to be the most critical problem facing wildlife today.

## PROCEDURE:

1. Review with the students the elements necessary for a habitat. (*Food, water, shelter and space, arranged suitably for the particular animal.)* After some discussion to make sure that the elements of habitats are clearly in mind, tell the students that in this activity they will be simulating wildlife in its habitat.
2. Divide the students into four groups: herbivores (plant-eaters), carnivores (meat-eaters), vegetation (trees, grasses, shrubs, etc.) and people who will be land developers. If the students are not familiar with the terms herbivore and carnivore, provide them with working definitions of those terms. Plan for three times as many herbivores as carnivores with a small number of developers in proportion to the other two groups. The numbers (amount) of vegetation may vary. For example, two developers, three carnivores, nine herbivores and six trees or bushes (vegetation).
3. Establish a large area—either in the classroom, with tables, chairs and desks moved to the sides of the room, or outside—that can be used to simulate the wildlife habitat area before development. The "land developers" are to stay on the sidelines at this time, simply observing the undeveloped land and its wildlife inhabitants—or meeting on their own, nearby, to make plans for development. In fact, they can make their entrance rather suddenly once the wildlife habitat has been established—simulating the arrival of heavy construction equipment.
4. Provide each herbivore with:
    - two desks or chairs to use as shelter
    - three pieces of green construction paper to represent food
    - one piece of blue construction paper to represent water
    - some of the vegetation portrayed by students
5. Provide each carnivore with:
    - one desk or chair to use as a lair
    - space equivalent to that used by three herbivores
    - three herbivores as a potential food source

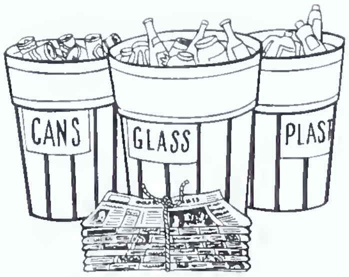
- one piece of blue construction paper to represent water, and
- some of the vegetation portrayed by students.

6. Ask the herbivores to arrange the food, water and shelter—including the students who are vegetation—in a space to represent their habitat. Once the herbivores have arranged their habitat, ask the carnivores to move into the area to establish their lairs and water sources, keeping an eye on the herbivores as possible food sources. For added interest, suggest that the students identify what particular kind of animal they are and role-play its characteristics.
7. Once all the animals are established in their habitats, it is time for the developers to enter the picture. These developers have been given the opportunity to create a housing and shopping area. (They may use three to seven minutes to construct their development, explaining their actions as they take them). They are restricted as to how much space they can use. They may use the space equivalent to that used by three herbivores. The developers may use the sheets and blankets to build their development. They may remove trees (represented by students) without physically hurting the students, shelter (represented by desks), food and water.
8. Once they have constructed their development, engage all of the students in a discussion of what happened. What action took place? With what consequences? Would or did any animals die? From what causes? Could the developers have done anything differently to change the consequences? Could they have developed several scattered small areas instead of one large area, or vice versa, with what effects? Would it have reduced negative consequences for wildlife if they put the development in a different area of the habitat? Rather than negative consequences, were there positive consequences? If so, what were they? How were they achieved? Ask the students to consider and discuss what seemed realistic about the activity and what did not. For example, sometimes development can take place that enhances the area for some kinds of wildlife. Often, however, it will not be the same kinds of wildlife that were in the area before development. Planners and developers can sometimes add to the vegetation in an area, creating additional shelter and food for some kinds of wildlife, and make water sources available under some conditions, if there is insufficient water in the area.

9. Ask the students to summarize some of the possible impacts on wildlife from human activities like development of land areas. Are there places in your community where wildlife habitat has been lost by human development? Are there places in your community where wildlife habitat has been enhanced by human activity? What alternatives, if any, are there to development of previously undeveloped areas? What trade-offs are involved; for example, in developing vacant areas within communities rather than undeveloped areas outside the communities? If development does take place, what kinds of actions can people take to minimize the negative consequences for wildlife, vegetation and other

elements of the environment? What about possible economic costs? Social costs? Ecological costs? Aesthetic costs? Discuss loss of habitat as something that is affecting wildlife all over the planet. Ask the students to summarize the importance of suitable habitat for wildlife. Discuss the students' concerns and recommendations.

## EXTENSIONS:



- Conduct this activity twice, with the students trading roles the second time. When the former wildlife become land developers, they could see if they could produce a development plan that could benefit the area for people and wildlife in some ways. The activity can also be conducted to show differences between developing the entire area—with likely loss of all wildlife in the area—to developing only part of the area, with some wildlife likely to survive.
- Ask students to complete the following sentence, and discuss their response: "If I were going to build a house for my family in a previously undeveloped area, I would . . .."
- Add more developers to simulate increased development pressures to meet the needs of an expanding human population.
- Research various development patterns in the local area. Which seem to benefit wildlife? Why?

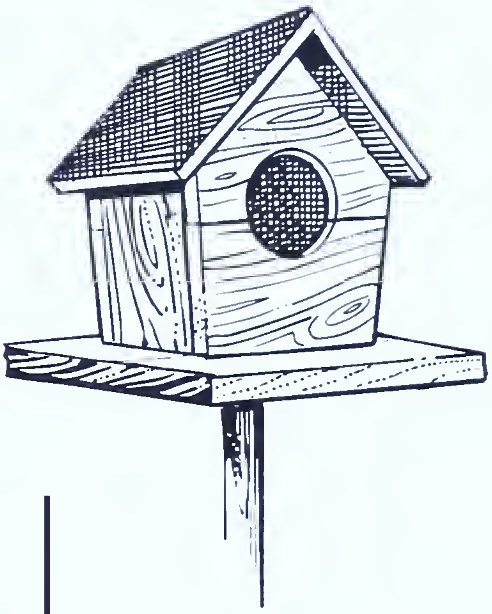
## EVALUATION:

- Name and describe three animals or plants that used to live in your area but no longer do.
- Describe the changes that seem most responsible for eliminating each of these animals and plants.
- Suggest and evaluate the advantages and disadvantages, if any, of possible actions that could have been taken to prevent the elimination of these plants or animals from the area.
- Name one kind of wildlife that would do better, and one kind of wildlife that would do worse, in areas in which humans cut down a forest and planted grass; dammed a creek to flood a valley; put in a housing development with large lawns and many shrubs; built a city on a lakeshore with crowded skyscrapers.

Reprinted with permission from:
Project WILD. *Project WILD K-12 Activity Guide.* Council for Environmental Education. © 1983, 1985, 1992.

# Lesson 6

# *Bird Habitat Evaluation*



## OBJECTIVES:

Students will demonstrate observational and data collection skills; have a general understanding of the food, habitat and water requirements of birds; and identify on-site actions to benefit birds.

## METHOD:

Students conduct a habitat survey and evaluation.

## MATERIALS:

*Habitat Survey and Evaluation Worksheets* (provided), *Habitat Improvement Worksheet* (provided), bird identification guides, list of local native plant species that benefit birds.

## BACKGROUND:

Songbirds inhabit many different kinds of habitats. Although all songbirds need food, water, shelter and space in these habitats, the proportion of and access to these habitat components is different in each. When performing a survey and evaluation of a habitat, all of these components need to be reviewed for their presence, amount and proportion. This activity will help students evaluate habitats by taking a closer look at the habitat components and other plant and animal species that are present.

This activity involves a trip outside with your class in order to conduct a survey of school property; make any advance preparations necessary to take your class outside. Identify a section of school property for the habitat survey. You may want to review some birds and plant species found in your general location to help students complete the habitat worksheets. You may want to know what plants benefit birds in your area. A list can be obtained by contacting the Pennsylvania Game Commission, county extension agent, wild bird supply store, or refer to the Audubon Council of Pennsylvania's publication, *APATH: Audubon Protecting Animals Through Habitat.* Review the point scoring system on the *Habitat Evaluation Worksheet.* Total point values are assigned for each habitat component—

**Age:** Grades 5-12

**Subjects:** Science, language arts, math

**Skills:** Observation, data gathering, generalization

**Duration:** Two 40-minute class periods

**Group size:** Small groups of five to six students; whole classroom

**Setting:** Outdoors

**Key vocabulary:** Habitat, survey, evaluation, species shelter, food, number of birds, etc. Students will assign appropriate point scores based on how well they think your school's property provides for these components. After completing the *Habitat Worksheets* most students will agree that there is much that could be done to provide more habitat for birds at your school. Encourage students to recommend actions to improve habitat for birds at your school, based on their knowledge of the general requirements of food, shelter and water for birds.

## PROCEDURE:

1. Explain to students that they will now put their knowledge of habitats to work at school. They will become biologists for the class period in order to develop a habitat survey of the school property.
2. Distribute the *Habitat Survey and Evaluation Worksheets*. Explain to students the point scoring system in which each component of habitat is assigned a score. Their job will be to assign the appropriate point score based on how well they think their school's property provides these elements. Distribute bird identification guides and plant lists. Work with students to identify birds and plants.
3. Prepare the class for the survey trip. Tell them they will have a limited period of time (one class period) to complete the worksheet.
4. While outside, have students identify as many different types of birds as they can. Have them obtain small samples of various plants on your school property. Students will only be able to complete a portion of the worksheet while outside.
5. Once back in the classroom, cluster students in small groups and distribute the bird and plant identification guides. Work with students to identify birds and plants and complete the survey worksheet. Have students total their points. Discuss results.
6. Ask one member of each group to volunteer to be a recorder. Ask another member to volunteer to serve as a spokesperson.
7. Ask students to discuss among themselves ways they could improve the point scores they obtained for the habitat components on school property. Encourage them to try to be as specific as possible to identify ways to increase scores to "total possible points". Encourage them to think about what they learned about birds' needs for food, shelter and water.
8. Distribute the *Habitat Improvement Worksheet*. Have students complete the worksheets individually and then discuss their answers with their small group. Have the recorder summarize the answers generated by each member of the group to develop a master *Habitat Improvement Worksheet*. The "master" copy will then serve as the group's Habitat Improvement Plan. Ask the spokesperson from each group to present the group's Habitat Improvement Plan to the class.

## EXTENSION:

- Working in small groups, have students create maps of the section of the school property visited on the survey. These maps will represent the school's current habitat conditions.
- Implement the recommended Habitat Improvement Plan. (Refer to Chapter 7, Lesson 4 and Appendix for additional ideas and resources.)
- Choose a local bird species. Research the bird's food, water, shelter and space needs. Determine if this species can live in your schoolyard.
- Work with Pennsylvania Game Commission, local National Audubon Society chapter, or county extension agent to develop a schoolyard habitat.

Adapted with permission from:
Office of Migratory Bird Management. *International Migratory Bird Day Packet.*
Project WILD. *Project WILD K-12 Activity Guide.* Council for Environmental Education. © 1983, 1985, 1992.
Project WILD. *WILD School Sites: A Guide to Preparing for Habitat Improvement Projects on School Grounds.* Western Regional Environmental Education Council, Inc./Project WILD. © 1987, 1992.
Tracy, Julie and Roderick, Mary. Hollywood Elementary School, Maryland.

# HABITAT SURVEY WORKSHEET*

Name(s): ____________________

Date: ____________________

## Habitat Evaluation

Location: ____________________

Weather: ____________________

Habitat type: (circle all that apply)

- Mixed Forest
- Deciduous Forest
- Agricultural Field
- Mixed Field/Shrub
- Mixed Field/Shrub/Some Trees
- Shrub
- Shrub with Some Trees
- Lake
- River
- Pond
- Stream
- Wetland
- Mowed Lawn
- Vacant Lot
- Urban Neighborhood
- Rural Neighborhood
- Other ____________________

Briefly describe habitat:

Major vegetation present:

Birds known to be on-site:

Does this site provide food for birds?
List potential food sources:

Are these foods limited to one or more seasons?
Which seasons?

Birds require different types of shelter. List possible places where birds may find the following types of shelter on your site:

Breeding/nesting: ____________________

Protection: ____________________

Resting: ____________________

---

*Used with permission from: Pennsylvania Game Commission, Harrisburg, PA.

Does this site provide adequate water?
List sources:

Does this site provide adequate space?
Where?

Are human activities compatible with birds inhabiting this site?
Explain:

Based on this habitat evaluation, what species of birds could live here?
To your knowledge, what birds live here?

List all birds seen or heard:

## HABITAT EVALUATION WORKSHEET

(Duplicate for students)

| ELEMENT | CONDITION OF SITE (POINT SCALE) | | POINTS SCORED |
|---|---|---|---|
| **WATER** | | | |
| Water at or near the site all year | Water at or near site only part of the year | No water at the site | ______ |

10------------------------------------------------5------------------------------------------0
(Highest score) (Lowest score)

| | | | |
|---|---|---|---|
| **SHELTER** | | | |
| More than 1/2 of of the site has shelter plants | Some of the site (1/4) has shelter plants | There are no shelter plants | ______ |

10------------------------------------------------5------------------------------------------0
(Highest score) (Lowest score)

| | | | |
|---|---|---|---|
| **FOOD** | | | |
| At least 10 kinds of plants that provide bird food | At least 5 kinds of plants that provide bird food | No plants that provide bird food | ______ |

10------------------------------------------------5------------------------------------------0
(Highest score) (Lowest score)

| | | | |
|---|---|---|---|
| **TRASH** | | | |
| No trash was found | 1-5 pieces of trash were found | 5-10 pieces of trash were found | ______ |

10------------------------------------------------5------------------------------------------0
(Highest score) (Lowest score)

**BIRDS SEEN**

List all species of birds seen. Score 2 points for each species of bird seen.

| | ***Bird Points*** |
|---|---|
| ______________________________ | ______ |
| ______________________________ | ______ |
| ______________________________ | ______ |
| ______________________________ | ______ |
| ______________________________ | ______ |
| ______________________________ | ______ |
| ______________________________ | ______ |
| ______________________________ | ______ |
| ______________________________ | ______ |
| ______________________________ | ______ |

***TOTAL POINTS*** ______

## HABITAT IMPROVEMENT WORKSHEET

How many points would an excellent bird habitat score? ____________________

How many points did your habitat score? ______________________________

How well do you think your school provides habitat for different species of birds? Explain your answer.

What could we do to improve the habitat's score?

# Lesson 7

# *Which Niche For Birds?*

**Age:** Grades 7-12

**Subjects:** Social studies (community studies, economics), career education, science (biology, life science), language arts, vocational agriculture

**Skills:** Analysis, application, classification, comparison and contrast, description, discussion, generalization, interview (guest speaker), listening, listing, public speaking, reading, reporting, research, small group work, synthesis, writing

**Duration:** One to four 45-minute periods

**Group size:** Any

**Setting:** Indoors

**Key vocabulary:** Ecological niche, career, community

## OBJECTIVES:

Students will define ecological niche; and give at least one example of a bird and its ecological niche.

## METHOD:

Students compare ecological niches with careers in their community.

## MATERIALS:

Guest speaker, chalkboard, reference materials.

## BACKGROUND:

Each animal has a role in the community. This is called its ecological niche. The niche includes such things as where the animal lives, where and how it gathers its food, its role in the food web, what it gives to and does for the community, its habits, periods of activity, etc.

An animal's niche can be described as "what it does for a living" or "what it does to survive." In a sense, this can be compared to what people do for a living, i.e., what their jobs or professions are in the community in which they live.

Songbirds occupy a variety of ecosystems, ranging from forests and wetlands to cities and fields. Songbirds, like other animals, have unique physical and behavioral adaptations that help them survive in these ecosystems. These adaptations, such as the shape of a bird's beak, feet, body and wings, as well as specific behavioral characteristics, like migration, nesting preferences and food preferences, combine to help define the niche of a species within the ecosystem. Some species have very specialized niches, while others are more generalists. The magnolia warbler lives around conifers and will only eat small insects. The song sparrow lives in brushy areas, wet meadows, marshes, and in backyards with shrubbery. Song sparrows eat a variety of insects, seeds, and berries.
Within each ecosystem each species has a certain niche. Different species typically occupy different niches, thus reducing competition for food,

shelter, nesting areas and water. This enables a variety of species to inhabit the same ecosystem.

Pennsylvania is home to a group of insect-eating songbirds that consider the forest ecosystem their home. The veery spends time on the forest floor, scratching for insects in the leaf litter. In the shrubby layer above the forest floor flit the indigo buntings. Brown creepers creep up and down the sides of tree trunks looking for insects hiding in the bark, while red-eyed vireos glean insects from leaves high up in the forest canopy. As the forest reaches a river, tree swallows can be seen dipping and diving to catch insects high in the air above. All these birds have two things in common: they live in a forest and they eat insects. However, within the forest, each species occupies its own niche.

Human beings also occupy a variety of ecosystems and have different roles in the community. However, in addition to physical adaptations, humans have the ability to think, reason, and make necessary adjustments to the environment. These attributes enable us to choose our roles in the community and create new roles where needed.

The major purpose of this activity is for students to understand the concept of ecological niche, simultaneously learning more about potential careers in their own community.

An animal's "niche" (rhymes with stitch) is its occupation within the environment. No two species can ever occupy exactly the same niche. However, the difference may be as subtle as the part of a tree on which two warbler species forage for insects.

## PROCEDURE:

1. Explain to the students that in this activity they will be comparing human professions to the roles of birds in the environment (bird "professions").
2. Begin with a discussion of jobs in the community. What jobs are there (those of parents, friends, their own, etc.)? (Optional: Invite a doctor, dentist, social worker, truck driver, cook, writer, painter, artist, etc., to the class to talk about their work.) Select a few interesting jobs for discussion. (Note: If a speaker visits, ask questions below of them or provide questions to them in advance. Work with students to develop the questions. Have the students take notes and record the answers during or immediately after the presentation, asking additional questions for clarification as necessary.) Points to include:
    - what they do for the community (the service they provide);
    - how they provide the service;
    - what resources are used by them in providing the service;
    - where they live and work;
    - the times during which they work;
    - what other professions they are dependent upon for the functioning of their profession (janitor, delivery person, secretary, repair person);
    - what special adaptations (skills, tools, behaviors) they use, find useful, or are required to have;
    - what other professions they compete with, if any;
    - what other professions they cooperate with, if any.

John Wiessinger

A more obvious niche distinction is that between the Red-tailed Hawk and the Great Horned Owl. They are about the same size; both feed on small mammals, birds, and reptiles; both hunt on the wing; and both inhabit a wide variety of habitats across almost all of North America.

Ask the students to produce a written summary of the information they acquire concerning each of the jobs they investigate.

3. Have the students brainstorm a variety of birds living in a particular community (forest, stream, meadow, backyard). A photograph could serve as a stimulus, or use the habitat cards found in the Appendix. List representative members of this natural community on the blackboard. Make sure a variety of birds, including predators, prey, scavengers, etc., are included.
4. Pick one of the birds listed. As a group, begin discussing the same questions for the bird as were asked of the visiting professionals. In this way the students can see how the "profession" concept applies as a metaphor. Identify the bird's profession as its "ecological niche."
(Optional: As individual or team projects, students should select one bird, research the "niche" it fills, and answer the same questions used for investigating human jobs. As a culmination, each individual or team can make a visual and/or verbal presentation about its bird and its niche.)

## EXTENSIONS:

- Identify niches that are overlapping. Note where there is competition or cooperation for resources and services. Connections may also be made between or among niches to illustrate interdependency webs in the community.
- Investigate a variety of human professions in different communities or cultures to develop career awareness. Illustrate overlapping professions, competition, cooperation and interdependency.
- Develop commercials or ads for "recruiting" individuals into given ecological niches, using special contributions, advantages, etc., as points to highlight.

## EVALUATION:

- Define ecological niche.
- Select any bird or person and describe its ecological niche. Include: the service provided for the community, how the service is provided, the resources used, where the individual lives, when the work is performed, what other organisms depend upon the individual, what other organisms the individual is dependent upon, what special adaptations are used or are required, what other organisms compete for the same niche, and anything else that seems especially interesting about this niche and how it is filled.
- Create a poster that shows all the facets of this animal's niche.

Adapted with permission from:
Project WILD. *Project WILD K-12 Activity Guide,* "Which Niche." Council for Environmental Education. © 1983, 1985, 1992.

# Background

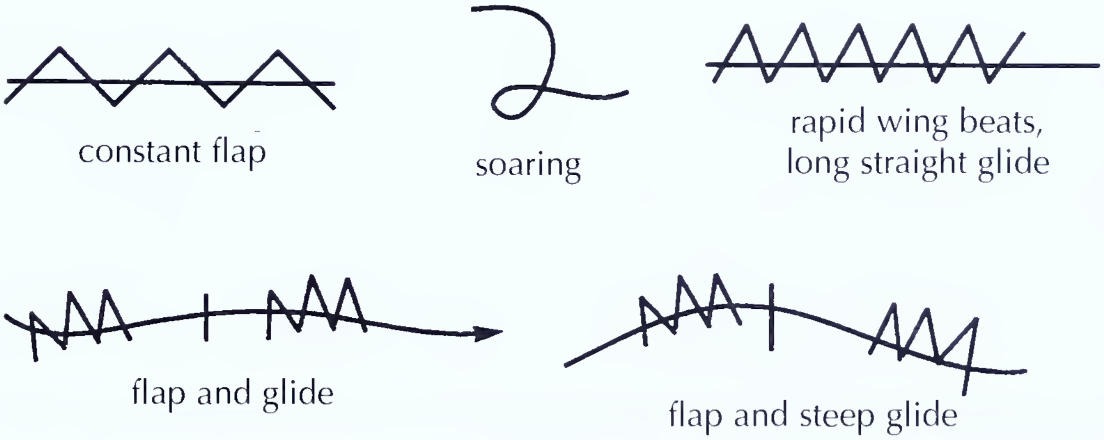
Observing birds is as easy as looking out the window or going for a walk around your neighborhood. Birds come in different sizes, shapes and colors. Take a few moments to watch the birds around you. Note their distinguishing features and watch what they are doing. What color are they? Do they have a crest? Do they have a stripe over their eye, or a distinct color on their breast? Perhaps their tails are long or their bill is really large. Are they on the ground or high in a tree? Maybe they are building a nest or feeding their young. Discovering the answers to these questions just takes a few moments and provides a great introduction to the amazing world of birds!

## BIRD BEHAVIORS

Birds have many and varied behaviors that are interesting to watch and help in identifying particular species. Unique behaviors have been observed in their eating, sleeping, fighting, mating, singing, flying, and in just the way they stand or perch. Because birds are always doing *something,* behavior is easy for students and adults to observe. Simply observing them while they visit a backyard feeder or make a nest in a park will create an awareness of unique bird behaviors.

A song sparrow typically repeats his song 15,000 times a day. But the record for a Pennsylvania resident goes to the red-eyed vireo: one was heard singing 22,197 songs in a day.

**Patterns of Flight**



Birds protect themselves from predators and other dangers in many different ways:

**Flocking:** Many birds gather together or flock to nest, feed, migrate, or roost. They usually flock with their own kind but sometimes with other species. It is hard for a predator to single out any one bird when the bird is part of a large group.

**Freezing:** Many hawks and other predators key in on movement so becoming very still or freezing is one way that birds can avoid becoming a hungry animal's meal.

**Alarm Calls:** Birds have their own special alarm calls. These short sharp calls send the message "watch out". Most bird will go into the brush, freeze, and wait for the danger to pass.

**Camouflage:** Camouflage is another form of protection. The male cardinal is very bright, but the female is dull. This helps her blend in when she is sitting on a nest.

**Scare Tactics:** Some birds try to scare enemies by making themselves look bigger and scarier than they really are. They may puff out their feathers, hold out their wings, open their bills, and even make noise to scare off a predator.

**Mobbing:** Sometimes a group of birds will come together to attack a predator like a hawk or owl. During this mobbing behavior the birds will dive, scold and chase the predator from the area.

One of the most obvious behaviors of birds is flight. Birds solve most of their problems by simply flying away, and it is their feathers that enable them to perform this function. Three types of feathers provide the bird with insulation, unique shapes, and assist them in their ability to fly. Birds exhibit specific patterns in their flight. Some fly in straight lines, some are erratic, some fly fast, others slow, some may fly in wave-like up and down patterns, while still others don't fly at all. Eagles and vultures soar on thermals, using the rising air currents to help them stay in flight. Hummingbirds flap their wings in a figure eight pattern at about 70 wingbeats per second. This enables them to hover and move backward and forward like a helicopter. Most songbirds typically fly between 15 and 40 miles an hour. The house sparrow is one of the slowest, flying only around 20 miles an hour.

Other behaviors that may be observed in birds are dust or water bathing, sunbathing, and preening. Birds probably bathe in dust to remove body oils that might cause feather matting and to rid themselves of parasites. Birds bathe in water to cleanse and cool themselves. How they bathe is unique to each species. Some dip their heads into water and throw it on their backs and wings, others dive into the water with the whole body. Birds can be seen sunbathing with wings outstretched to one side soaking up the sun's rays, and almost everyone at one time or another has seen a bird preen. Picking out bugs, rearranging feathers and covering feathers with oil from a gland on the rump at the base of the tail are all considered preening. By preening with body oil, birds are able to waterproof their feathers and insulate against the cold.

Special behaviors are also exhibited during predator/prey confrontations. You may have seen a group of house finches sitting in a tree or a titmouse fluffing up its feathers to look more ferocious. Songbirds signal others when danger is present, fly away from a situation, posture in a fighting position to scare the predator off, scramble for cover or freeze in position so as not to be seen. All these behaviors help ensure the safety of the bird. Many birds migrate, roost, feed and nest in flocks. One of the benefits of flocking is safety in numbers. The greater the number of birds, the more eyes there are to detect predators in time to flee. Flocks also serve as centers to share information, such as food sources, assist in heat conservation, help stimulate and synchronize breeding and aid in the care and education of young.

## Feeding

Songbirds exhibit many different feeding behaviors. They may feed on the ground, in the water, in the air, in flocks, or alone. Take a moment to observe birds at a feeder. Do they eat the seed at the feeder or fly away to some type of cover before consuming their food? What are they eating? How are they adapted to eat these things? Some birds eat insects; others eat berries and seeds.

Birds that primarily eat seeds tend to have short, stout beaks. Cardinals will feast on sunflower seeds from the feeder. Nuthatches will collect seeds, store them in the cracks of a tree and go back to eat them later. Birds that primarily eat insects tend to have short, sharp, pointed beaks. Bluebirds are always on the lookout for a nice juicy grasshopper.

Some birds feed on the ground while others feed in flight. Most of us have seen robins pulling worms from a lawn, but how many of us have seen eastern phoebes grab a mosquito in flight? Watching bird feeding behaviors and observing how and what they eat not only will help provide insights into songbirds but will help identify the species.

## Vocalizations

Songbirds generally have two types of vocalizations—a call and a song. Calls are crisp, clear sounds that are made year-round by both males and females. They can be a soft chirp or a raucous scream. Calls may be used to warn others about danger, signal their location and gather their young. Alarm calls are similar among species. Therefore, other birds and sometimes even mammals will recognize and respond to these calls.

Songs are characterized by a series of notes sung repeatedly as a recognized pattern. They are species-specific and usually performed by the male as part of courtship. These songs help males attract potential mates and alert others as to their territories. Some species, like the mockingbird, imitate songs. Songbirds sing mostly in the morning and evening, with highest activity during the breeding season.

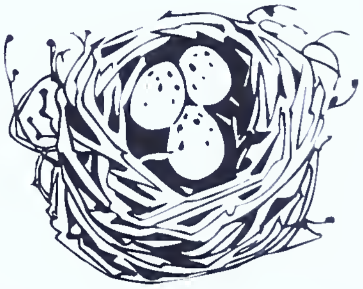
BIRDING ETHICS

1. Never disturb a nest.
2. Observe from a distance.
3. Do not interfere with a bird's activities.
4. Be aware of other animals and plants and avoid harming them.
5. Respect private property.
6. Remember: Birds are wild animals, respect them and give them space!
7. Share your birding experiences with others.

(For a complete listing of ethics and bird watching, write to the American Birding Association. The address is in the Appendix.)

## Mating and Nesting

As males announce their territories, any bird trespassing may be attacked. Therefore, it is important that there be a way for males to distinguish between other males and interested females ready for breeding. In some species, sex recognition is based on color. We probably have all seen the bright red male cardinal and the duller brown-red of the female. In other species, the female is recognized by her behavior. An interested female song sparrow will act submissive and will make special call notes to pacify the male. Singing is not the only way males try to attract females. The male house wren will establish a territory and start constructing several nests to attract the late-migrating females. The female inspects the nests constructed and, when she finds one to her liking, mates with the builder. Once paired, songbirds may then feed each other or display their colors, or fly together to further strengthen the pair bond.



Most species of songbirds establish a territory for breeding. These territories typically include a nest site and an abundant food supply. Generally, the larger the bird, the larger the territory. There are some species that will establish a small territory that includes just the nesting site, then share a larger area for food with others of the same species. This behavior is exhibited by herons, egrets and swallows, which nest in colonies. Usually the male establishes the territory and tries to attract a female to it. The territory is defended from intruders in several ways, including singing, threatening display, chasing and fighting. Most songbirds are ready to breed for the first time from the age of nine months to one year.

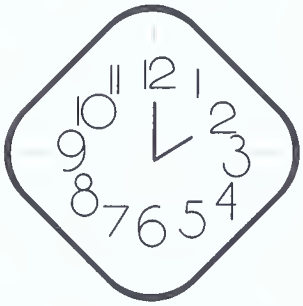
Birds make nests in many different places and from many different materials. Nests are species-specific. Most species are very exact about the materials they will use and the placement of their nests, while other species are not. A robin builds a nest of dried, packed mud, with sticks and grasses forming the bowl, and is usually built at the forks of branches. The house sparrow will nest in cavities and use any material that is available.

Once the nest is made, the female starts laying eggs. The color, shape, size and number of eggs vary with species. Typically one egg is laid every 24 hours, although some species, like hummingbirds, may have 36 to 48 hours between eggs. Once the eggs are laid, the parent must keep them warm. During this time most female songbirds lose their insulating feathers and develop a rich supply of blood vessels in an area on their bellies. This helps in incubating the eggs. This area is referred to as the incubating patch or brood patch, is warm to the touch and may appear to be inflamed. In songbirds, females spend the most time on the nest incubating the eggs and develop a brood patch.

With songbirds, incubation starts after the last egg has been laid. Eggs are incubated for various lengths of time depending on the species. Generally, the larger the bird, the longer the incubation period. During this time the eggs are turned occasionally to ensure uniform heating and development. Most songbirds incubate for 12 to 15 days. When incubation is complete, the young birds hatch from the egg. Hatching is an arduous task that can take 15 to 20 minutes in some songbird species. Using a special projection on top of the bill (called the egg tooth) and a strong "hatching" muscle found on the head and neck, the young bird laboriously breaks its way out of the egg.

Newborn songbirds are weak, naked and have their eyes closed. This type of young bird is referred to as altricial and is dependent on the parent birds for everything. Other species, such as ducks and geese, are born with a full set of downy feathers, fully alert and are able to run or swim within a few hours. These birds are referred to as precocial. Once hatched, the young birds are called nestlings. Songbirds may remain in the nest for anywhere from less than 10 days to 5 weeks depending on the species. The evening grosbeak stays in the nest for about two weeks, while sparrows spend less than 10 days in the nest. Most cavity-nesting birds remain in the nest longer than those who nest in the open, and ground nesters tend to leave the nest the earliest. Generally, the time songbirds spend in the nest is about equal to their incubation period. Sometimes they leave the nest to hop around branches and exercise their wings just prior to taking their first flight. Once they leave the nests, the young birds are referred to as fledglings. Parents remain close to their young and may continue feeding them until the fledglings are ready to fend for themselves.

Observing birds with a friend is fun. Trying to describe the location of a bird to your friend may be difficult. So, many birders use the clock method. Just picture a clock in your mind, then indicate the location of the bird using a time point. For example, a cardinal is at 2 o'clock.



The typical adult passerine makes 4 – 10 trips to the nest each hour (12 hours or more each day) to feed its nestlings.

## Migration

Migration is another unique behavior in birds. Some species, like the eastern bluebird and the robin, migrate to the southern part of the United States for the winter. Other species migrate to Central or South America to spend the winter in the tropics. The scarlet tanager, hummingbird and catbird are a few examples of these neotropical migrants. Migration behavior within a single species may vary. Some may migrate, while others do not. Although most bluebirds migrate, many stay here in Pennsylvania.

The primary reason for birds to migrate is to obtain food. Most migratory songbirds are insect eaters, so when fall comes and insect populations are low, the birds migrate. Their route, destination and timing varies with species. Observing bird behavior related to migration can be a continual activity throughout the school year. Students can correlate weather, temperature, food availability and length of daylight to arrival and departures of birds in the spring and fall. Which species returned earliest? Which species left first? Do birds migrate during the day or night?

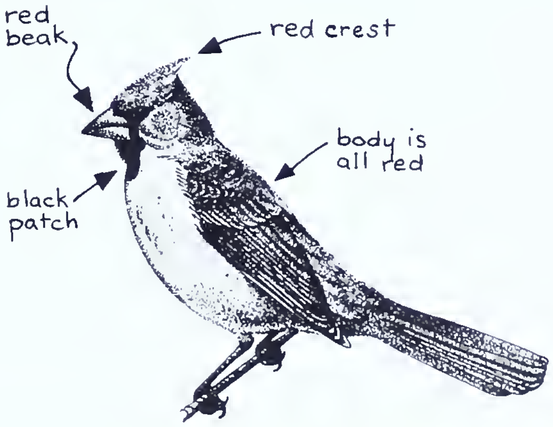
Migration is an interesting and somewhat mysterious bird behavior. Scientists still do not have all the answers concerning migration. More about this topic can be found in Chapter 4 of these materials.

The annual cycle of bird behaviors provide an interesting and ever-changing drama throughout the year. As songbirds return to breed and the air is filled with melodious song, we know that spring has arrived. Flocks migrating south indicate fall and the coming of winter. Many hours can be spent in the field, backyard or schoolyard observing and studying bird behavior.

Most nestlings raised in open-cup nests spend only about 8 – 10 days in the nest after hatching, but the young of cavity – nesting species remain within their well-protected confines about twice as long.

## BIRD IDENTIFICATION

Identifying birds is a natural extension of watching birds. As you continue your observations, you will notice that bird species look, act and sound differently from each other. They also live in different habitats. Begin by first taking a look around. Are you in a forest, a wetland or your backyard? Then, take a closer look at the bird. Note the color, size and shape of the bird. Next, look for distinguishing markings, such as eye stripes, wing bars, white patches or unique color patterns. The colors, shapes and patterns that help to identify a bird are referred to as "field marks." With this information, you can refer to a field guide to help identify the bird. You will probably be able to identify the more common birds of your area. However, as you become more involved with watching birds, you will discover that there

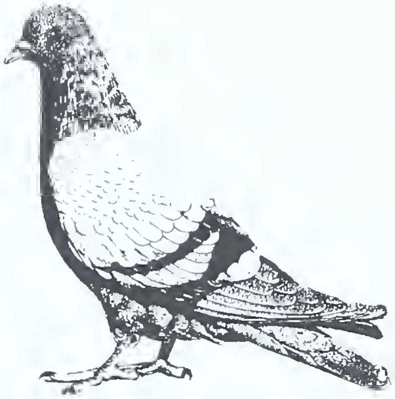


Source: *Illinois Department of Conservation* are many species that look alike. Sparrows, often referred to as "LBJs" (little brown jobs) are an example of birds that look alike. As you become a more experienced birdwatcher, you will be able to distinguish these birds by sight, or you may have to rely on the bird's call or song. There are many tapes available to help you become familiar with bird songs.

Identifying a bird species is a lot like solving a mystery. To identify the species of birds, you sift through a variety of clues such as habitat, behavior, size, shape, color, field marks and song.

House Sparrow 6"

American Robin 9-11"



Rock Dove 13"

## KEY POINTS TO IDENTIFICATION

**Compare sizes:** Use a familiar bird such as a robin for comparison. Observe the new bird and compare. This bird is "larger than," "smaller than," "same size as" a robin.

**Note shapes:** Is the bird chunky or slender? How is the bill shaped? How might this bill shape be used for obtaining food? Is it short? Long? Conical, like a cardinals? Tweezer-like, as a wren's? The bill usually tells you to which family or group a bird belongs.

**Wings:** Wing configurations provide clues to flight style and identity of the bird. Are wingtips round or pointed? Long, narrow, pointed wings are suited to long-distance flying and soaring over water (terns). Long, broad, rounded wings are for soaring over land or for long distances (hawks). Pointed, flat wings are for swift flight (swallows, for catching insects in flight). Short, rounded wings are for quick take off and rapid escapes (pheasant, grouse).

**Tail:** The length, shape and way the tail is used provide another clue in determining the identity of the bird. Examples: broad and fanned (red-tailed hawk); stiff and forked and used as a prop (woodpeckers); stiff and held in an upright position (house wren); short (nuthatch); long (mourning dove).

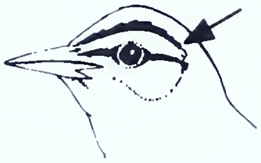
**Legs and feet:** Shape and size tell much about the bird's habits and where it lives. Look at color, length, size and shape.

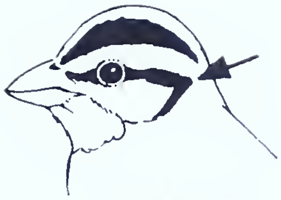
**Note other field marks:** What color is the bird? Brightly-colored birds are usually easy to identify. Often the males of certain species are brightly-colored while the female's coloring is dull so she blends in with the natural surroundings (see expanded information, Chapter 1). The female's coloring often protects her and the nest from being seen by enemies.

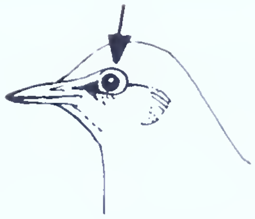
**Pattern examples on face:** Note head shape (cone shape, like a cardinal, or tufted like a great horned or screech owl?) and color pattern on face (brown hood of a cowbird); eye rings (spectacles—eye ring that extends to bill); eyebrow (eye stripe above eye of Carolina wren); eye line (line that passes through the eye of blue-winged warbler); light and dark contrasts on cheek, like the chickadee.

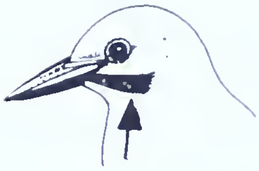
**Body patterns:** Note what contrasts you see in areas like the belly. Many

### Special Markings


eyebrow


eye stripe


eye ring


mustache

birds have two or more colors on the belly, e.g., bluebird: brown breast and white belly; barred owls: dark brown horizontal barring under face, vertical barring on breast.

**Tail:** Watch for contrasting colors. The white outer tail feathers of juncos and meadowlarks and the white rump patch of flickers are considered banner marks (contrasting colors that are flashed when the bird takes flight). Banner marks serve to divert an approaching predator's attention, giving the bird vital escape time. These marks may also assist in keeping a flock of a species together during flight.

**Note flight:** What type of flying is the bird doing? Is it soaring, or undulating, or diving? Is there a pattern to its flight? For example, does it flap, sail, flap, sail? (See flight patterns under bird behavior section.)

**Note sounds:** What does the song or the call sound like (long notes or short, high-pitched or low, repetitive or variable)?

**Note behavior:** What is the bird doing? Is it scratching on the ground or pecking at buds on a tree? Perching in a tree? Clinging to the bark? Is it alone or in a flock? Does it hop, swim, walk or run?

**Note site:** In what type of habitat did you see the bird? Where exactly was it? For example, a bird might be on the beach, wings tucked and facing the wind.

**Note season:** What season is it?

Illinois
Department of
Conservation
life and land together

## OUT IN THE FIELD

Going out into the field to observe birds is a lot of fun, whether it is a walk around your neighborhood, a visit to the park or an expedition to another state or country. A good time to observe most birds is usually early morning or evening. You do not need a lot of equipment, but it is often nice to take along binoculars, a field guide, and a pencil and pad to record or sketch your sightings. Of course, you should also have a map of the area if you are entering unfamiliar territory.

Before leaving your home, make sure you are dressed comfortably and have water and food for longer trips. If you are going in the woods or fields, you should take precautions to protect yourself from ticks. It is always a good idea to let someone know where you are going and the time you intend to return. There are times you will want to get a closer look at the birds. But before you get too close, remember that birds are wild animals and you need to respect their space. By climbing a tree to look at a nest during breeding, or standing right next to your feeder, you interfere with the bird's activities. One way to observe birds closely without actually getting too close is to use binoculars.

## Binoculars

As you prepare to purchase binoculars, consider where you will use them, how powerful you want them to be and how much weight you can carry. Will you use binoculars on long hikes or just at your window? Do you want to get a closer look at birds at your feeder or do you want to search for birds in the field? Your answers to these questions will help narrow down your choices.

Typically, binoculars are marked with a power and a diameter such as 7x35 or 7x50. The first number indicates the magnification power of the binocular, the second indicates the diameter in millimeters of the objecting lens (the lens that faces the bird). The rule of thumb is to have the diameter at least 5 times as large as the power. A good beginning pair of binoculars will have a power of 7 and a diameter of 35. Not all 7x35 binoculars have the same clarity, shape and weight. It is always a good idea to try out different brands and styles of binoculars before you purchase your own. Binoculars can run from cheap to expensive, so set a budget before you shop and purchase the best pair you can afford.

## Field Guides

There are many different field guides to identifying birds available to the birder. Some guides cover all the birds found in North America, while others are available for specific regions of the country and for states. For the beginning birder, the guides specific to state or region will make it a bit simpler to identify birds in the area.

Field guides are the tool to use in identifying birds. However, they should not be used only when out in the field or by the window watching birds. Before you begin birding, become familiar with your guide, the format and the content. Personalize the guide by highlighting those common birds you are likely to encounter. For use of the field guide during field trips, remember that although birds are grouped in taxonomic order (their evolutionary sequence), your guide can be mentally grouped into thirds: first third—water birds, second third—land birds, and final third—perching birds. Then, have the guide readily available when you bird and also around your home so you can glance through them whenever you have a few moments to spare. This will help you become more familiar with the guide and the information it contains.

Field guides are organized in many different ways. Roger Tory Peterson's *A Guide to the Birds of the Eastern United States* (Boston:

Houghton Mifflin Company, 1980) is divided into sections based on bird families. This guide has realistic drawings of birds and indicates key features for identification. Peterson also has a "First Guides" series, including a guide to bird identification. These guides are especially designed for the beginner and are easy and fun to use. Audubon's *Field Guide to Birds* (New York: Alfred A. Knopf, Inc., 1985) uses color photographs of birds and is divided into sections based on the types of birds, e.g., perching birds or pigeon-like birds. These guides are available in most book stores. There are other bird books that provide identification hints, but also help answer many questions about bird behavior and biology. *Birds of Pennsylvania* by James and Lillian Wakely (Harrisburg: Pennsylvania Game Commission, 1994) features a summary of an enormous variety of topics concerning birds, from cavity-nesting to migration, and includes color pages of birds arranged by habitat. This book is available from the Pennsylvania Game Commission (see Appendix). The Nature Company's *Guide to Birds* (New York: Time Life Books, 1996) also covers many topics related to birds and birding, and provides color photographs with natural history information on birds grouped by habitat. This is also available in bookstores.

As you become more involved in bird-watching you may want to take part in citizen science activities. You can help monitor pigeons as part of Project PigeonWatch or trends at bird feeders in Project FeederWatch (a joint National Audubon Society/Cornell Laboratory of Ornithology project; call 607-254-2425 for more information), or help monitor population trends in the National Audubon Society's Christmas Bird Count (call Geoff LeBaron at 202-979-3000 for more information). You also may wish to contact your local Audubon chapter, bird club, state park or Pa Game Commission office to see if there are any projects where they could use help. Most state and county parks have a bird list or are in the process of making a bird list.

*See Bibliography for references.*

# Lesson 1

# *How To Identify A Bird*

**Age:** Grades 4-8

**Subjects:** Science, language arts

**Skills:** Classification, comparison and contrast, generalization, observation

**Duration:** One to three 45-minute periods

**Group size:** Any

**Setting:** Indoors and outdoors

**Key vocabulary:** Field marks, classification

## OBJECTIVE:

Students will gather data for the classification and identification of bird species.

## METHOD:

Students learn how to identify birds through observation and written descriptions of key field marks.

## MATERIALS:

Bird field guide (see Appendix), notebook for journaling or *Bird Journal Worksheet* (provided), *Songbird-At-A-Glance* (provided), clipboard, pencil, models or silhouettes showing approximate size of a robin.

## BACKGROUND:

By looking carefully at birds you will notice that birds look and act differently from one another. Just as people come in distinct shapes and sizes and vary in the color of their eyes, skin, and hair, birds come in many shapes, sizes and colors, too. Some birds are brightly-colored while others are dull. Birds have diverse styles of locomotion; each bird has favorite foods and specific habitats in which they live.

To learn a bird's identity and hence its species name (robin, cardinal, etc.), the students will sort through a variety of visual and auditory clues such as behavior, size, shape, color, habitat, field marks and songs. Learning the field marks and key field names (characteristics that separate one bird from another) is part of the basic steps necessary in the identification process.

Begin by asking yourself what markings are on the bird. In addition to color, size and shape, markings such as eye stripes, wing bars, white patches and color patterns can help correctly identify a bird. The markings on a particular bird are called its "field marks." All of this information can help when using an identification key or field guide to find the name of a bird. Field guides are books that have pictures and information about birds. Birds are generally grouped by family in a guide.

## PRE-PLANNING:

Arrange for a class field trip to a favorite habitat or set up bird feeders on the school grounds so that a variety of birds are attracted.

## PROCEDURE:

### Part One

1. Hand out *Songbird-At-A-Glance* reference page. Refer to the various body parts. Explain that noting key field marks on certain areas of a bird can aid in identification. (Refer to field marks under Chapter 3, Background Information.)
2. Give groups a bird field guide and in a game fashion, have them look for distinctive characteristics. For example:
    - List birds with bills longer than their heads.
    - List birds with white patches on wing or tail feathers. (By fanning the feathers, the white patches may be used as signals.)
    - What families of birds are mostly camouflaged? List examples.
    - What species show similarities in coloration? List examples.
    - Find all the birds starting with a particular first initial.
    - Which bird has the largest eyes? The longest tail?
    - Find the smallest bird; find the largest.
    - If the bird book shows range maps, which birds can be found on both the east and west coasts?
    - Which species have different plumage for male and female birds?
    - What birds are common to your local area?
3. Choose a songbird flashcard from the Appendix (or a magazine photo) and walk students through the *Bird Journal Worksheet.*
    - Have students draw a basic diagram of a bird in the space provided.
    - Next, have students add key identification characteristics.
    - Students should note if bird is a land, water or perching bird, and what the bird appears to be doing.
4. Next, have the students observe at least one bird in the schoolyard. Using their *Bird Journal Worksheet,* have them record the information, then look up their bird in a field guide. Here's a tip for getting information down quickly in the *Bird Journal Worksheet* so it isn't forgotten.

> *Have participants draw a general outline of a bird on several sheets of unlined paper in their notebook or use several copies of Bird Journal Worksheet. On the side print the name "Robin." When they spot a new bird, turn to one of these sheets. Indicate its size by adding a "plus" sign if it is larger than a robin, and a "minus" sign if it is smaller.*

*If the new bird has a brown back, write "brown" on that part of the bird outline. If its breast is spotted, write "spotted" on the breast of the bird outline. Indicate the length of its bill by writing either "long" or "short." Do the same for its tail, wings, and legs. If it flies in a straight line, draw a straight line under your outline. If it flies up and down, like a roller coaster, draw a wavy line instead.*

*Note where the bird is seen. Habitat is a good clue to what the bird actually is.*

*After participants have filled in two or three of these outlines, they'll find that this is easier than writing everything down in detail. They'll also find that they are getting better at quickly spotting the outstanding field marks of each bird they see.*

## EXTENSION:

- Make a photo album of each bird that students identify using their data sheets. Have them do a report or a poem on a favorite bird.
- Keep a class list of birds observed and identified.
- Incorporate math skills by keeping a tally of the frequency of bird sightings. Graph the results. What species are seen most often?
- Is there a pattern to their sighting, i.e., same time of day, location, etc.?
- Invite a member of the local National Audubon Chapter or bird club to class for a bird walk or talk.

## EVALUATION:

- Using birds common to your area, acquire pictures or use songbird flash cards (see Appendix) and tape them to the back of each student. Students ask identification questions about their bird such as: What size is it? What color? Where does it live? These should be birds that students already know. Have them try to guess the birds on their backs.

## RECOMMENDED LITERATURE:

Gill, Peter. *Nature Club Birds*. Troll Associates, 1990.

Adapted with permission from:
Kane, Patricia F., Rosselet, Dale A. and Anderson, Karl. *Bridges to the Natural World*. New Jersey Audubon Society.
*Illinois Birds*, Illinois Department of Natural Resources Educational Services.

## BIRD JOURNAL WORKSHEET

Date:

Weather:
Temperature:

Time:

Location:

Habitat:

Robin

Flight Pattern:

# BIRD JOURNAL WORKSHEET — EXAMPLE

Date: September 12

Weather: Sunny

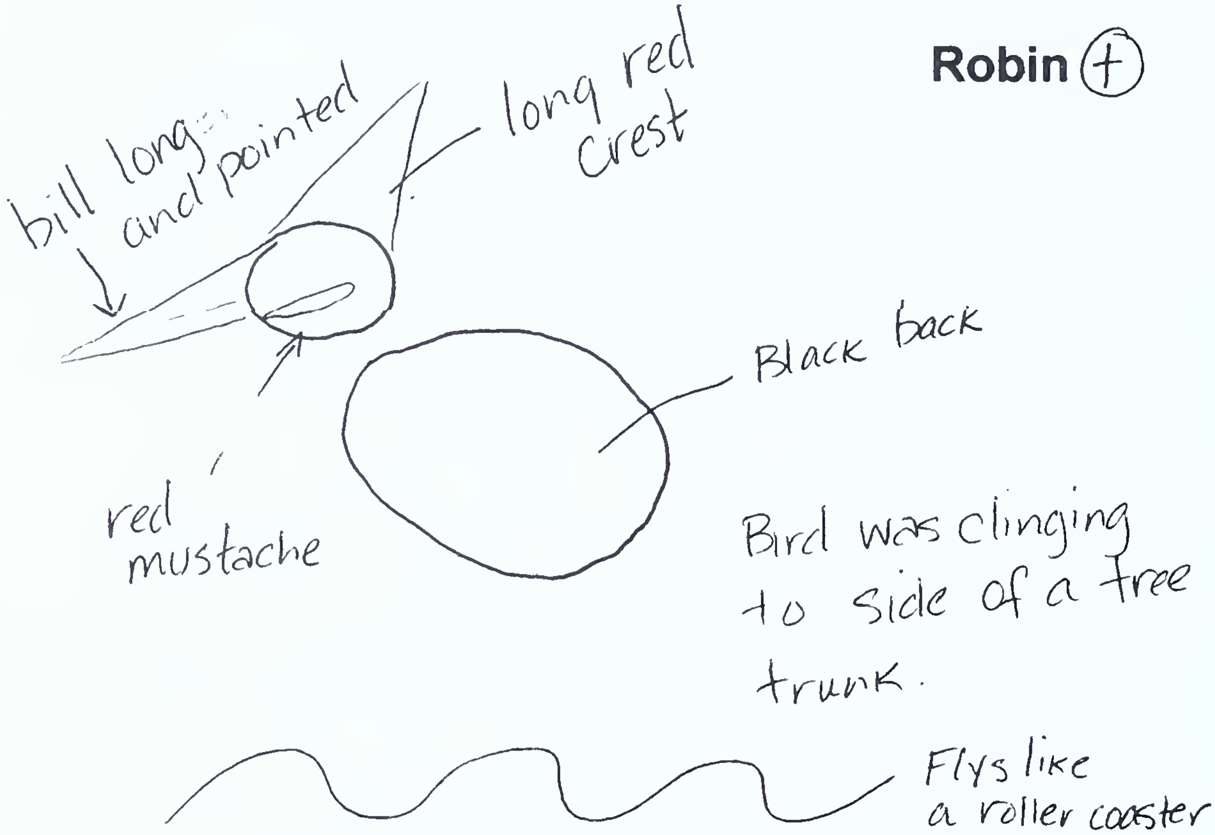
Temperature: 75° F

Time: 9:15 am

Location: Woods behind house.

Habitat: Forest

**Robin** (+)



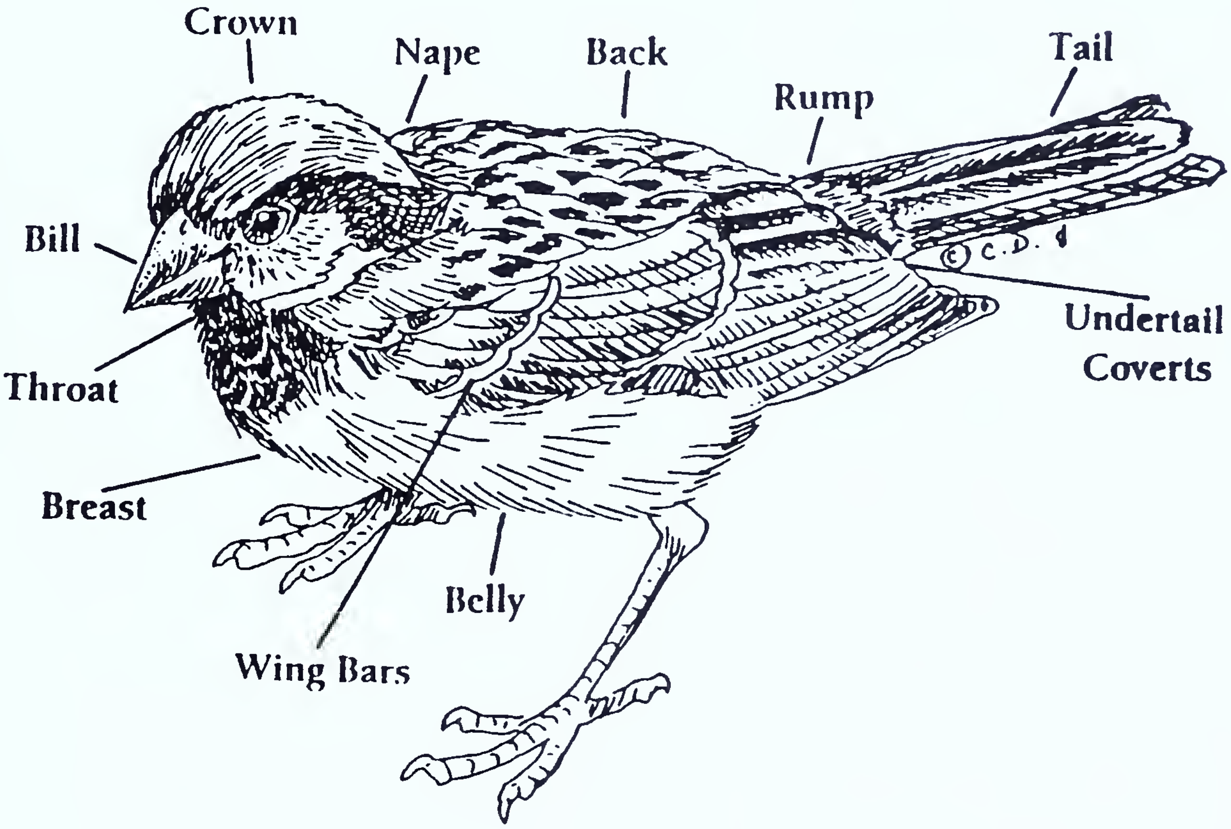
Bird was clinging to side of a tree trunk.

This is an example of a Pileated Woodpecker and its ***key field marks***. These are the features that separate it from every other species.

**Key Field Marks:**

- long, red crest
- red mustache
- curving band of white from back of neck (nape) and down to breast.
- large patches of white on the underwing.

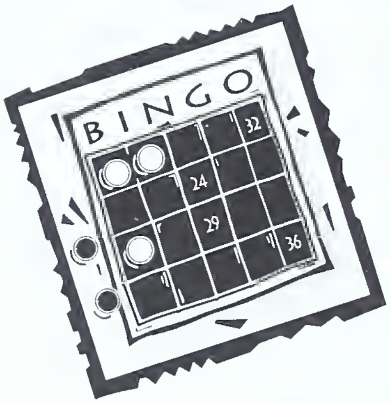
# Songbird-At-A-Glance



Source: *Kane, Patricia F., Rosselet, Dale and Anderson, Karl. Bridges to the Natural World. New Jersey Audubon Society, 1992.*

# Lesson 2

# *Bird Behavior Bingo*



**Age:** Grades K-3

**Subjects:** Science

**Skills:** Observation

**Duration:** One class period

**Group size:** Any

**Setting:** Outdoors

**Key vocabulary:** Behavior, adaptation, preen, flock

## OBJECTIVE:

Students will describe two different bird behaviors and how they help birds survive.

## METHOD:

Students go for a hike, search for different bird behaviors and play bingo.

## MATERIALS:

*Bird Behavior Bingo Card* (provided); grease pencil.

## BACKGROUND:

Observing birds in the wild is fun but does take some patience and skill. The observer must be able to locate the bird, watch what it is doing and try to identify it all within a few moments. This activity concentrates on looking for different behaviors exhibited by songbirds.

Before going out to observe birds in an area, think about where birds may be found in your area and what time birds will be most active. Most songbirds tend to be very active in the morning and evening. Refer to this chapter's background information for further detail.

## PROCEDURE:

1. Initiate a discussion with students about bird behavior and the ways in which some behaviors help birds and other animals survive. Pass out the *Bird Behavior Bingo Card* and ask students to look at the bird in the bird bath. What is the bird doing? Why? Explain that bathing helps birds get rid of pests such as mites and lice. And just like people, birds may cool themselves off on warm days by getting wet. Look at the bird hiding. Why would a bird hide? Look at the picture of the birds flocking together. Why do birds do this? One important reason that birds flock is that they are safer in a group than they would be by themselves. That's

because a bird is less likely to be attacked by a hungry animal when it's part of a group. Safety in numbers applies to other animals as well. Ask the students for some other examples. *(School of fish, herd of deer, colony of ants, swarm of bees.)*

2. To wrap up the discussion about how birds and other animals survive and stay healthy, talk about some specific features that certain birds and other animals share. For example, show the students a picture of a lion and an eagle and ask the group how the two are alike. *(Both animals hunt other animals for food.)* Point out that lions, eagles and many other predators have sharp claws on their feet for grasping their prey. Porpoises and penguins are also alike. Like porpoises, penguins spend a lot of time in the water. The penguin's flipperlike wings, similar to a porpoise's flippers, help them move quickly through the water.
3. Have students make their own bingo boards by cutting out the picture squares on the *Bird Behavior Bingo Card* and pasting or gluing them in a different order on a piece of cardboard. Have the students use the boards as is or cover them with clear contact paper to make them stronger and reusable. Just have the children mark on the "permanent" boards with a grease pencil which is easily removed (or wiped).
4. Next take the students outside. (Make sure they all bring along their boards and something with which to write.) Whenever students spot (or hear) one of the behaviors pictured on their boards, have them mark the picture with an “x”. Then talk about the behavior. For example, if they saw a bird preening, discuss how and why birds preen.
5. Occasionally birds are observed doing two things at once. For example, you could see a flock of pigeons feeding. If this happens, the students can either mark both pictures (in this case, the feeding and flocking squares) or just one, depending on available time.
6. The first person to mark three pictures in a row, either across, down or diagonally, is the winner. (If reusable boards were made, the game may be varied by making the requirements different each time. For example, "bingo" could be all four corners, an L-shape, a T-shape, or a Z-shape.)

## EXTENSION:

- Do this activity at different times of the year and keep a classroom chart of what the students observed. Compare the findings.
- Have students match the activity with the season
- Have students design their own bingo boards and copy for the class.

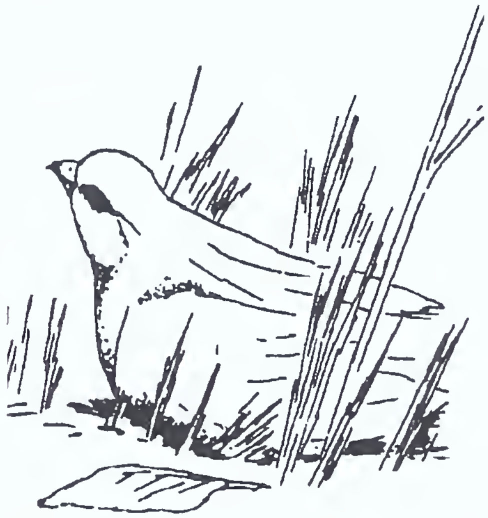
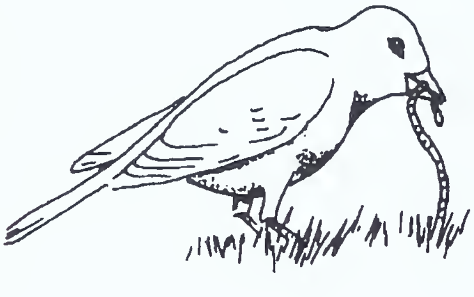
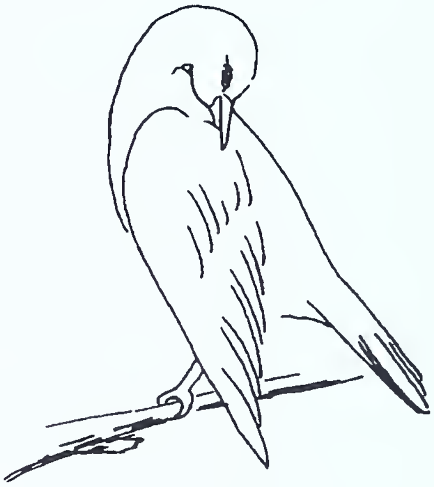
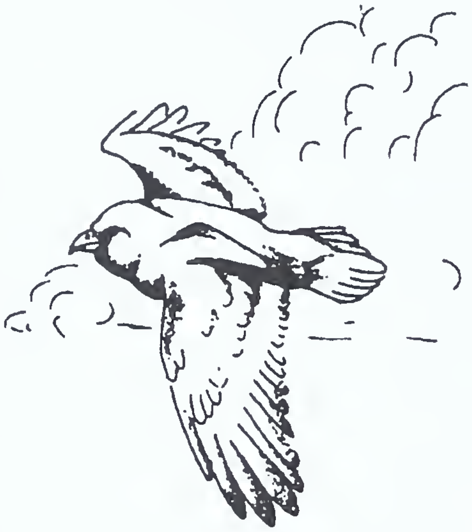
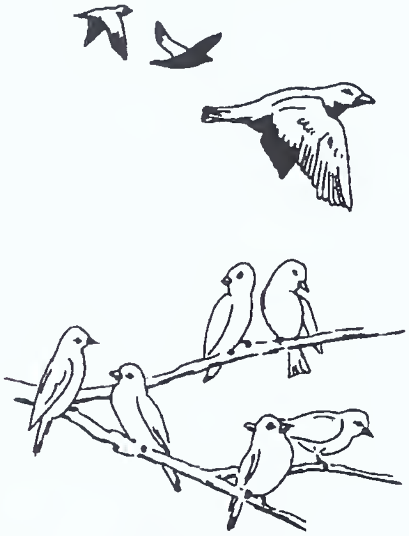
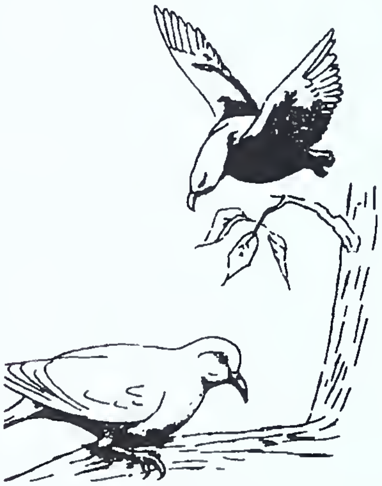
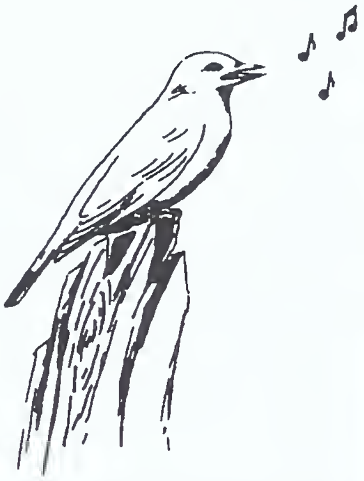
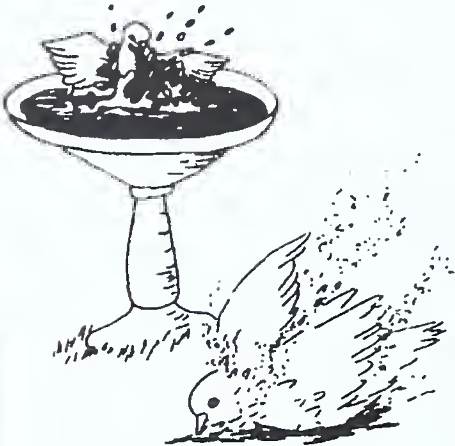
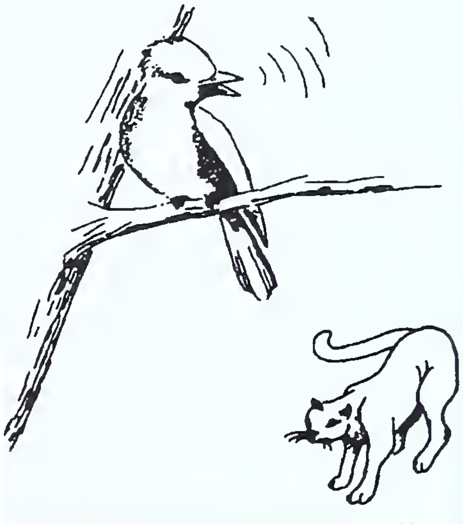
## EVALUATION:

- Students identify two behaviors and explain how these behaviors help the birds.

Used with permission from:
National Wildlife Federation from the “Birds, Birds, Birds” issue of *Naturescope*.

## ACTIVITY: BIRD BEHAVIOR BINGO

Watch a bird's behavior and match three across, down, or diagonally for bingo.

| | | |
|---|---|---|
| <br>Hiding | <br>Feeding | <br>Preening |
| <br>Flying | <br>Flocking | <br>Freezing (sitting still) |
| <br>Singing | <br>Bathing (in water or dust) | <br>Giving an alarm call |

*This sheet used with permission from Iowa Birds*

## Lesson 3

# *Observing Birds In The Wild*

## OBJECTIVES:

Students will identify different behavior patterns of birds and explain their function.

## METHOD:

Students observe different behaviors of birds in an activity similar to a scavenger hunt.

## MATERIALS:

Worksheet, *Observing Birds in the Wild Student Sheet* (provided), binoculars (optional), field guide, notebook, pencil.

## BACKGROUND:

Observing birds in the wild is fun but does take some patience and skill. The observer must be able to locate the bird, watch what it is doing and try to identify it all within a few moments. This activity concentrates on looking for different behaviors exhibited by songbirds.

Songbirds may be perching on a branch, singing to attract mates, feeding their young, searching for food on the ground, preening their feathers—really any number of behaviors. A bird's behavior may be a particular adaptation to help the bird survive. For example, flocking is a behavioral adaptation that helps protect a bird from a predator. Behavior may be specific to one species or found in many species. A white-breasted nuthatch can walk down a tree head-first. This is the only bird in Pennsylvania that exhibits this behavior. Knowing the behavior patterns of birds and of different species of birds is fundamental to our understanding of songbirds and can help in their conservation.

Before going out to observe birds in an area, think about where birds may be found and what time birds will be most active. Most songbirds tend to be very active in the morning and evening.

**Age:** Grades 4-12

**Subjects:** Science (language arts or English if using extension)

**Skills:** Observation, classification, summarization

**Duration:** One class period (can be extended)

**Group size:** Any

**Setting:** Outdoors

**Key vocabulary:** Behavior

## PROCEDURE:

1. In this exercise, students will be looking for birds exhibiting different types of behavior, like flying, swimming, or singing. When a behavior is spotted, place a check in the space provided on the worksheet. Identify the species if possible.
2. Go over these tips for bird observations:
   - Before beginning fieldwork, dress in comfortable clothing that is dully-colored. This helps the observer blend into the natural habitats being explored. Also, sneakers are good footgear as they enable the observer to move about quietly.
   - Gather needed equipment—field guide, binoculars (if possible), a notebook, pencil and worksheet.
   - Conduct field work in a natural habitat, if possible. Get permission from landowners to walk on private property. To see the most variety of birds, try to visit a local wildlife sanctuary, state park, or federal refuge.
   - Try to search for birds within an hour or two of dawn or a couple of hours before dusk. These are the times when birds are most active.
   - If the bird's name is known, record it; otherwise, note its colors, distinguishing features and observed behavior.
   - Don't forget to record the type of natural habitat where the bird is observed. Look at the surroundings carefully. Then, describe the physical environment, including the types of plants present, the time of the year, and the weather. This information will help the student/observer understand the natural conditions each species needs to survive.
   - Always remember—the natural environment comes first. Never harm or disturb an animal, plant or nest. Also, never take an animal away from its habitat. No bird, or other creature, can exist for very long away from its own environment.
3. Choose an area and take students out to conduct the search. Students can work individually, in pairs or in groups.
4. Return to the classroom and summarize the information. Have students discuss why a particular behavior may be a benefit or detriment to a bird. Consider the following questions: Were any behaviors not observed? Why? Did any single species seem to be exhibiting a particular type of behavior? Why?

## EXTENSION:

- Do this activity during different seasons and compare the findings.
- Have students choose a species of bird and record behavior patterns at different times of day over a week or more time period.
- Conduct this same activity in different habitats or parts of the schoolyard at the same time. Compare and contrast results.
- Have students write a poem or a story about what they observed.

## EVALUATION:

- Students identify three bird behaviors and explain how these behaviors may be of benefit to songbirds.

Adapted with permission from:
*Illinois Birds,* Illinois Department of Natural Resources Educational Services.

## Observing Birds in the Wild

Look for the behaviors listed below. Check those you find, then list specific location and habitat. Where possible, identify the bird. If you can't, list some identifying features.

| Check | Behavior Items | Specific Location and Habitat | Identification |
|---|---|---|---|
| | A bird singing or calling (Most singing birds are males) | | |
| | A bird preening (Sometimes a preening bird looks as if it is nibbling or tugging at its feathers Other times it looks as if the bird is combing its feathers with its beak) | | |
| | A bird bathing in water | | |
| | A bird taking a dust bath | | |
| | A bird soaring | | |
| | A bird flying (The wings are beating) | | |
| | A bird perched on a limb or branch | | |
| | A bird hovering in mid-air (The wings are beating rapidly) | | |
| | A bird swimming | | |
| | A bird walking or hopping on the ground | | |
| | A bird diving or tipping up its rump in the water | | |
| | A bird standing on the ground | | |
| | A bird wading in water | | |
| | A bird feeding | | |
| | A bird flying with a worm or insect in its mouth | | |
| | A bird flying with or gathering twigs, grasses, leaves, or string, etc. | | |

| | | | |
|---|---|---|---|
| | A bird perched on the edge of its nest | | |
| | A bird climbing a trunk or branch | | |
| | A bird hanging upside down from a branch | | |
| | A bird chiseling into the side of a tree or branch | | |
| | A bird perching on a wire, fence post, tree snag, etc. over an open area | | |
| | A flock of small birds chasing a large bird | | |
| | A group of birds flocking together | | |
| | Other (List behavior) | | |
| | Other (List behavior) | | |

Answer the following questions:

Choose two behaviors you observed and explain what the bird was doing and why .

1. Behavior:
   Explanation:

2. Behavior:
   Explanation:

A bird's behavior can sometimes help in identifying the bird. List one behavior you observed and explain how that behavior could help in identifying the bird.

# Lesson 4

# *A Dawn Chorus*

*Cornell Laboratory of Ornithology*

**Age:** Grades K-6 (adaptable for all ages)

**Subjects:** Life science, music

**Skills:** Communicating, observing, classifying, experimenting

**Duration:** 30 minutes

**Group size:** 10 or more

**Setting:** Indoors or outdoors

**Key vocabulary:** Song, call

## OBJECTIVES:

Students will describe two reasons why birds sing; and identify the call of at least two bird species.

## METHODS:

Students learn bird songs by imitating a Dawn Chorus and participating in a game of musical chairs.

## MATERIALS:

Reference page, Bird Songs (provided), pictures of birds (flash cards in Appendix), cassette recorder, blank cassette, bird song tape or record (optional) (see Appendix for list of suggested recordings).

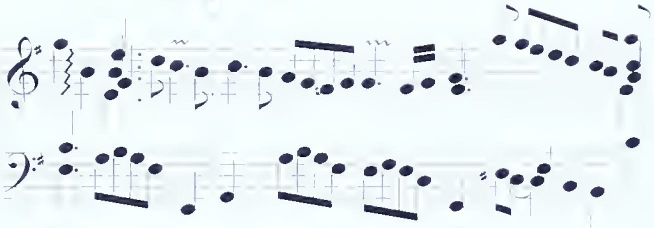
## BACKGROUND:

Why do birds sing and why especially in the spring? Song plays an important role in the annual cycles of many birds, as it signals courtship proceedings and defines the territorial holdings vital to producing and successfully rearing young. When one considers the small size of birds, the distances that may separate them, and the many obstacles that act as visual barriers (like leaves and trees), it is no wonder that songs and calls are the most effective ways to communicate.

Songbirds form the group of birds known as passerines, or perching birds. Being small, and often having to migrate hundreds or thousands of miles annually, their life spans are relatively short. It would be unusual for both partners to live through many seasons; thus, songbirds do not mate for life, but rather find a mate each season. It could well be the same mate that instinctively flew back to the same territory and responded to the previous year's mate, but it is thought that the pair bond does not last beyond caring for the young in most passerine species. The song is thus very important to reproductive success. Song quickly and effectively announces the presence of a particular species of bird, its desire to mate, and the territory that particular bird has claimed.

It is important to emphasize that each species of bird has its own specific song, although there are occasionally regional dialects. This species-specific song enables potential mates to recognize, respond to, and find each other, and also causes a flight or possibly a fight response in a bird that intrudes into the territory of a like bird. Within the song pattern of a given species there are, however, individual characteristics that enable birds to distinguish their mate's songs. Sophisticated recordings and visual renditions of songs in sonograms have allowed researchers to study subtle differences inaudible to the human ear. Male birds are usually the songsters, because it is they who most often establish the territory, attract a female into it, and then defend it. There are a few common exceptions in which females occasionally sing as well, such as the bluebird, the northern oriole, the cardinal and the white-throated sparrow.

Birds do not have vocal cords, but rather produce their songs by controlling the frequency of vibrations made by the membranes in the syrinx, or voice box (see Chapter 1, Background Information). Air, when released from the lungs under a certain amount of pressure, causes these membranes to vibrate. The number of syringeal muscles in a given species of bird determines its ability to vary the vibrations. Crows and mockingbirds, which produce a great variety of sounds, have eight pairs of muscles, while pigeons, with their simple cooing, have only one pair.



Some birds are born with the ability to sing their species' song; others have to hear it and practice. Young birds begin singing anywhere from eight days to 13 weeks after hatching. Their early songs are called subsongs and consist of notes or phrases from what should become the primary song. If reared among members of its own species, the young bird usually has perfected its song by the spring after its year of birth.

The time of year when birds sing is related to their reproductive cycle, which in turn is timed to coincide with the maximum food supply for the offspring, usually spring and summer. It is thought that the length of day, i.e., increasing daylight in late winter and early spring, stimulates the production of hormones that result in breeding behavior and readiness. The ability and desire to sing is part of that process. The time at which the bird ceases to sing varies. Some stop as soon as mating has occurred; others, not until all care of the young is completed.

The daily song cycle also varies. Most birds sing early in the morning with the amount of light again triggering the impulse. Members of the thrush family are often the first heard at dawn, followed by insect eaters, which can find their flying food outlined against the early morning sky. Many seed-eaters and hole-nesters seem to wait for better light. In the heat of the day most birds are quiet, although one account described a red-eyed vireo that sang its song 22,000 times in the course of ten hours. Towards evening, many birds resume their singing.

Songs serve well to attract mates and to mark territories, but there are other messages that need to be communicated: aggression, alarm and location of food. Most of these are conveyed by brief, relatively simple call notes, such as the blue jay's warning scream.

The study of bird songs can last a lifetime. First, one becomes aware of differences among their sounds. Then, certain songs are associated with specific birds, until eventually it is ears even more than eyes that tell the experienced birder what birds are in the area. To learn about birds and their songs is to give new dimension to the world around you.

## MOTIVATIONAL ACTIVITY:

1. "Introduce yourself." *(Students say name.)*
2. "Why don't we all have the same name?"
3. "How would you warn someone of danger?" *(Shout, yell, scream.)*
4. "Show how you would protect your favorite belonging from a thief." *(Aggressive behavior.)*
5. "If people communicate different messages in different ways, what messages might a bird want to communicate?" *(They identify themselves, they warn of danger, and they defend and delineate territory.)*

## PROCEDURE:

1. Tell the class that many birds like to sing in the morning and that this is called the dawn chorus. As a class they are going to learn some bird songs and create a dawn chorus.
2. Divide the class into groups. Each group will represent a different bird. If working with very young students, select only two or three birds for the entire class.
3. Show the students a picture of a bird, imitate its song, and have the students practice the song as a class.
4. Give each group a picture of one bird, imitate its song, and have the students repeat the song (see attached sample bird songs). Have students practice the songs.
5. Tell the students that a dawn chorus starts softly (pre-dawn), gets louder (at dawn and shortly afterwards), then gets soft again (as the heat of the day sets in).
6. Arrange the students in a half circle. Explain to them that as you point to each of them, they are to begin their songs and continue until you point to them again.
7. Allow the entire group to sing for 10 seconds, then begin pointing to the students to stop.
8. Record the chorus on a cassette, and play it back for the students.

## EXTENSION:

- To introduce bird songs, make a tape of five locally common bird songs with about one minute of song for each species. Divide the students into five groups (use fewer songs if there aren't enough people for five groups), and assign a different bird song to each group. Play the tape until each group is familiar with its bird song. Make a second tape with short segments of the five different songs in random order. Include each species at least three times. Have each group stand up when its members hear their bird song and then sit down again. Switch the songs assigned to each group and repeat the exercise.

- Ask the students to listen to the bird songs around the schoolyard or their homes. See if they can recognize any of the ones used in the *Dawn Chorus.*
- Listen to the "real" song of the birds used in the activity. Bird tapes and records are available in some libraries, or sometimes through local Audubon chapters or bird clubs.
- Find out how other animals communicate
- Research one of the birds in the *Dawn Chorus.* Find out what food it eats, where it nests, and some unique adaptation or behavior.
- Perform *Bird Songs Puppet Show* found in Appendix. Discuss why birds sing.
- Read *The Birds Have a Party* found in Appendix. Have students use bird songs to write a similar story.

## EVALUATION:

- "Do birds actually say words when they sing?" *(No. People have given human words to some birds' songs to help them remember the sound of the songs.)*
- "Why do birds sing?" *(Birds sing to communicate with other birds and animals.)*
- "Why don't all birds have the same song?" *(Each species of bird has its own song so it is better able to communicate with its own species.)*
- Place chairs in a circle so that there is one less chair than the number of students. Play recorded bird songs of the birds selected for the activity while the students walk around the circle in one direction. When the bird song stops, the students must sit on a chair. The person without a chair must choose a seated participant to correctly identify the songster(s). If the seated person answers correctly, the person left standing waits off to the side. If answered incorrectly, the person left standing must identify the singer and the seated person moves off to the side. If answered correctly, he/she sits down on the vacant chair. If answered incorrectly, the standing person stands off to the side and an extra chair is removed. Continue the game, removing one chair after each round. This game can be made more sophisticated by using a specific bird song as the signal to sit down.

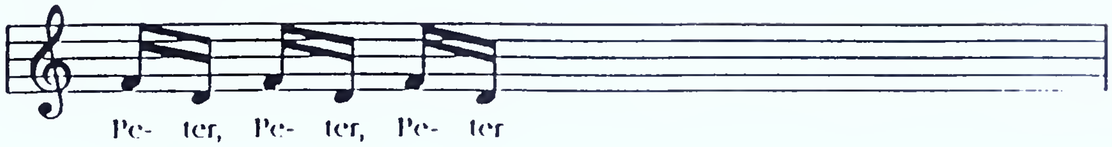
## RECOMMENDED LITERATURE:

Brozna, Barbara. *The Birds Have a Party.* Jersey Shore Audubon Society. A read-along story on bird vocalizations (see Appendix).
Wolff, Ashley. *A Year of Birds.* New York: Dodd, Mead & Co., 1984.

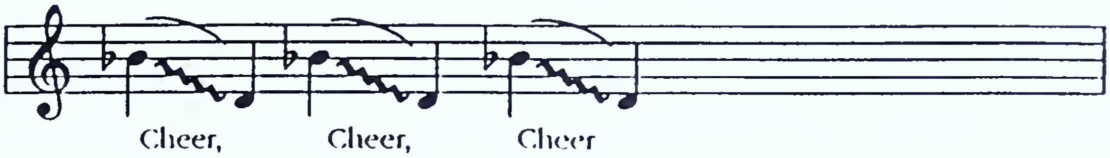
Adapted with permission from:
Lingelbach, Jenepher. *Hands-On Nature.* Vermont Institute of Natural Science.
Kane, Patricia F., Rosselet, Dale A. and Anderson, Karl. *Bridges to the Natural World.* New Jersey Audubon Society.

## Bird Songs

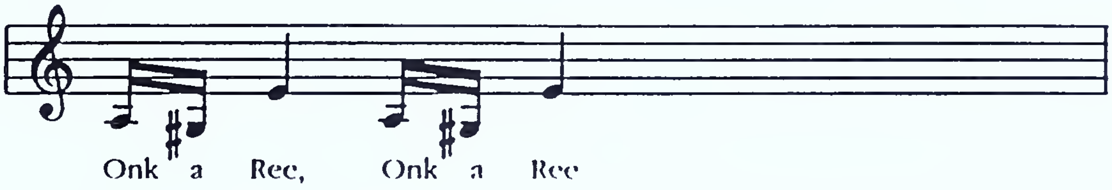
### Tufted Titmouse



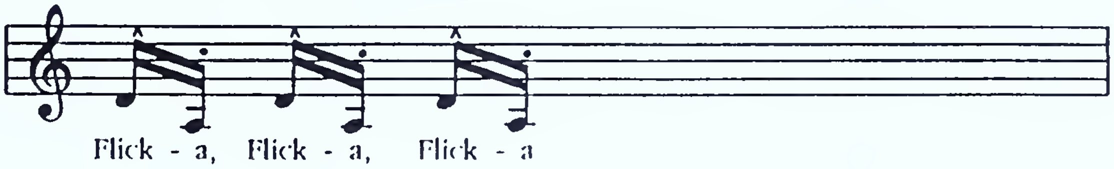
### Northern Cardinal



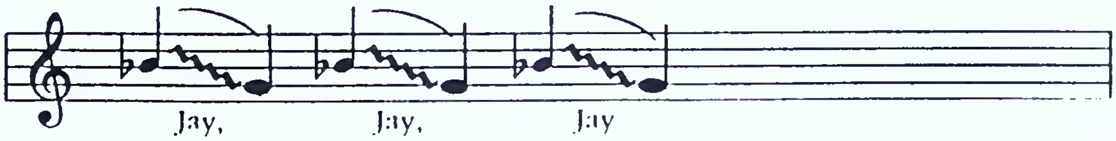
### Red-winged Blackbird



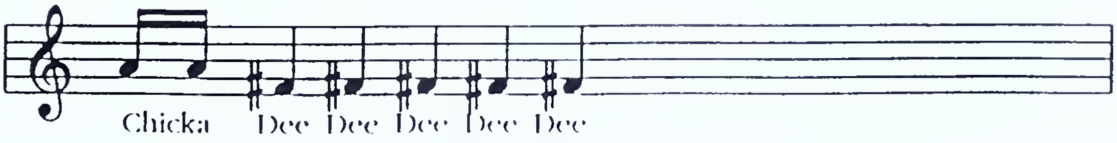
### Yellow-shafted Flicker



### Blue Jay



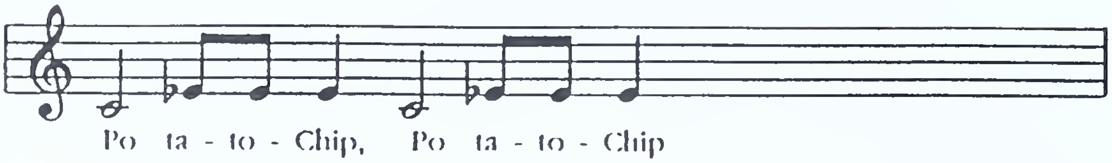
### Black-capped Chickadee



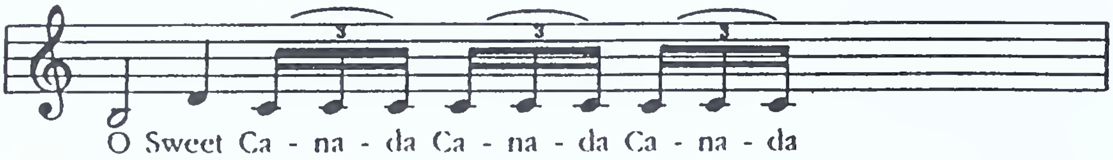
Source: *Bridges to the Natural World, New Jersey Audubon Society*

## Bird Songs

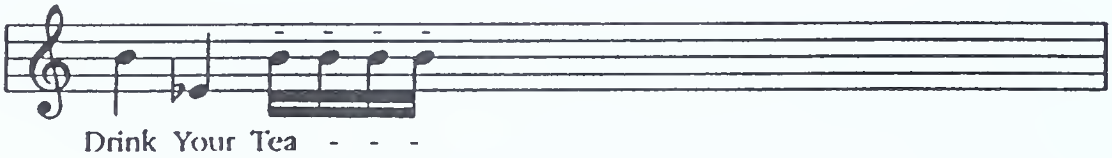
### American Goldfinch (Eastern)



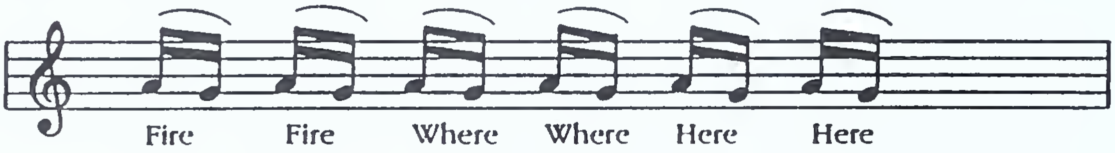
### White-throated Sparrow



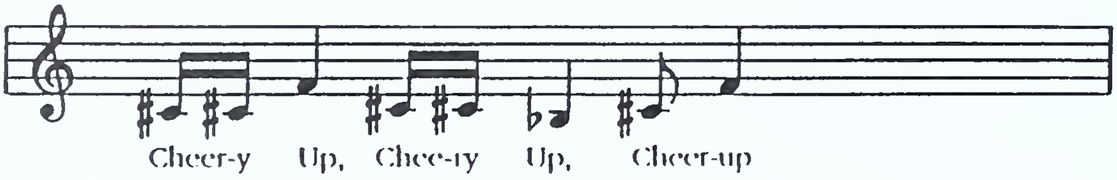
### Rufous-sided Towhee



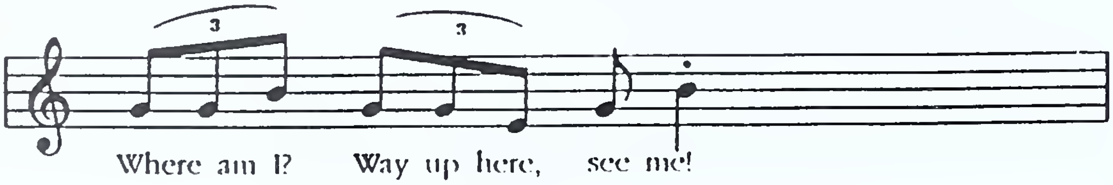
### Indigo Bunting



### American Robin



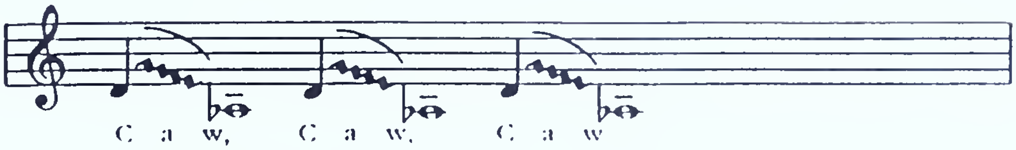
### Red-eyed Vireo



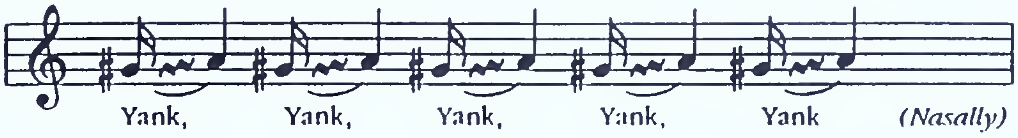
Source: *Bridges to the Natural World, New Jersey Audubon Society*

# Bird Songs

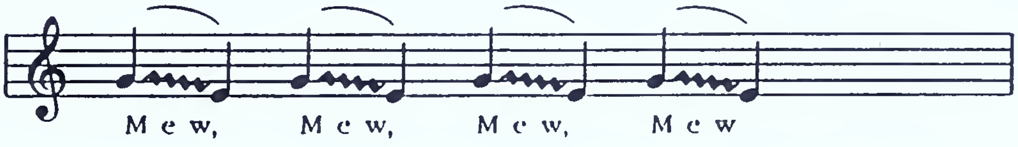
### American (Common) Crow



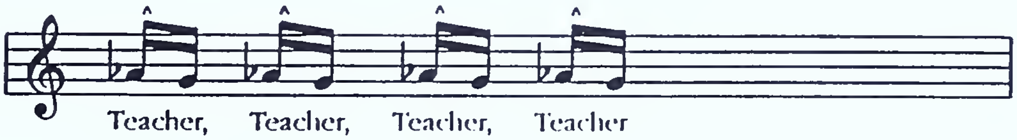
### White-breasted Nuthatch



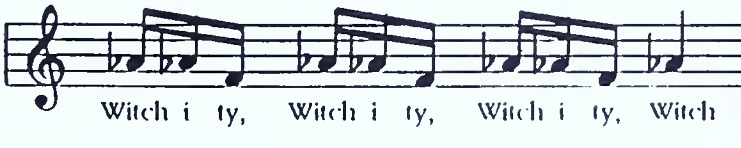
### Gray Catbird

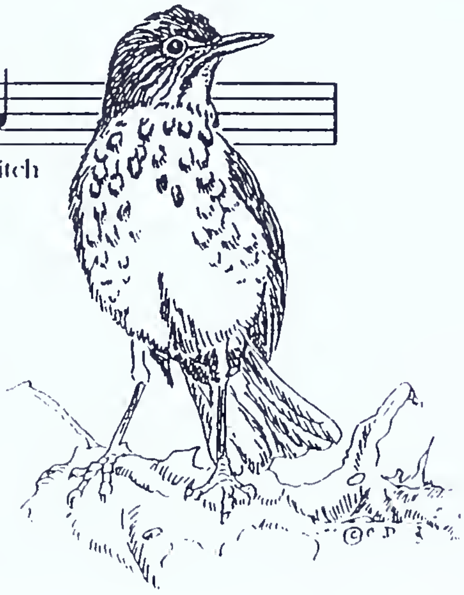


### Ovenbird



### Common Yellowthroat





Source: *Bridges to the Natural World, New Jersey Audubon Society*

# Lesson 5

# *Songbirds And Their Nests*

**Age:** Grades 3-6

**Subjects:** Science, language art, social studies

**Skills:** Researching, synthesizing and creating, classifying and categorizing, observing

**Duration:** Two 45-minute classes

**Group size:** Any

**Setting:** Indoors and outdoors

**Key vocabulary:** Nest, habitat, scrape nest, platform nest, cup-shaped nest

## OBJECTIVES:

Students will describe and compare the nests of several different kinds of birds; associate the nest and bird with its respective habitat; and be aware of the location and construction of the nest and relate it to the identification of its maker.

## METHOD:

Students use cards of birds and their nests to learn about different types of nests, then take a walk to associate the nest and bird with its type of habitat.

## MATERIALS:

Variety of nests* or photographs of nests, activity cards, *Songbirds and Nests* (provided), *Nesting Inventory Sheet* (provided), *A Field Guide to Birds' Nests* (Harrison) or *Birds, Nests and Eggs* (Boring), clipboard, pencil, paper, ruler or measuring tape.

## BACKGROUND:

Students studying bird nesting or spring phenology ("the study of relations between climate and periodic biological phenomena such as bird migration") will find this activity a natural tie-in. Leaders may wish to have on hand some examples of different birds' nests to stimulate the students' curiosity. Visit a robin's nest or other active nests, but do not disturb. A spotting scope or binoculars will aid viewing both the nest and the nestlings.

---

*A teacher or educator from a public school who wishes to keep a collection of migratory bird parts or nests at the school for educational purposes should write to the U.S. Fish and Wildlife Service (P.O. Box 129, Newtown Branch, Boston, MA 02158) to obtain a letter of permission. Leaders who have no affiliation with a public educational institution and who do not have a permit must limit their students to observing nests and feathers where they are found. Feathers for use in the classroom can be obtained from a poultry farm.

## PROCEDURE:

1. Begin by asking what kinds of animals build nests *(squirrel, birds, insects, fish)* and for what purposes. Relate nests and their purposes to human houses. How do they compare in terms of structure, size and materials?
2. Hand out *Songbirds and Nests* cards from Appendix and have students try to match birds and nests. Allow pairs a few minutes to read their cards and look up in a field guide or reference book more information on their bird and its associated nest and habitat (optional).
3. Go outside and spend 15-20 minutes looking for bird nests as a group. Good places to look include trees, building eaves and ledges, bird houses, shrubs, streambanks and tall grass.
4. Have pairs try to locate the respective bird nest that corresponds to their *Songbirds and Nests* card. If they cannot find that particular bird nest, have them choose one that is readily available. In a notebook or on a *Nesting Inventory Sheet* have them note habitat, location, shape of nest, height above ground, materials used and whether or not the nest is that of a songbird. Use *A Field Guide to Birds' Nests* to identify the nest maker, if possible.
5. If they cannot locate their nest, have them explain why *(not looking in proper habitat, lack of nesting places, etc.).*
6. In a sharing circle, discuss different types of nests found or shown on the cards. In the evolution of nests, no doubt the first type was a scrape, then the platform, followed by the cup nest. About 75% of songbirds build open cup-shaped nests. They are versatile and can be built almost anywhere.

## EXTENSION:

- Look for nests in the schoolyard throughout the late winter and spring. Keep records and watch to see if any nests are reused, or if material is taken from old nests by birds building new nests. Use attached *Nesting Inventory Sheet* to get started.
- Hang mesh bags (from onions or oranges) of nesting materials from a tree in early spring, and watch to see if any materials are taken by birds. Materials to use might include yarn, string, hair (from people or pets) and small strips of cloth, foil or paper. Natural materials (grass, straw, small twigs, leaves and flowers) can be added as well. Cut the materials into five-inch pieces and put them in the mesh bags so that the ends stick out.
- Build bluebird houses or other bird houses and place them in appropriate locations where students can check on them throughout the spring. Bluebird box plans can be found in Lawrence Zelany's *Bluebird: How You Can Help Its Fight for Survival,* Indiana University Press, or by contacting the Pennsylvania Bureau of State Parks (717-783-4356) for a bluebird brochure.

Barn swallows may make more than 1200 trips to carry mud to one nest.

## EVALUATION:

- Use cards found in this chapter to have students match bird to its nest.
- Why do birds build nests? *(Nests provide a place to lay and incubate eggs, and to care for the young until they are able to fly. The nest usually provides protection for the eggs and baby birds from rain, hot sun and predators.)*
- What different kinds of nests do birds build? *(Refer to* A Field Guide to Birds' Nests. *Birds build nests in cliffs, trees, shrubs and grasses, and on buildings, bridges, ground and water. Materials vary greatly from mud, grasses and twigs to bark, feathers, thistledown and spider webs.)*
- Does the site provide protection from rain, sun and predators—or will it, once the leaves come out? *(Students may decide the site is too exposed, or in a lawn mower's path, etc.).*
- Is there a source of food and water nearby?
- Are materials for nest-building available nearby?
- Did anyone find an actual nest or nest hole while looking for an ideal site? *(Great! That means the student is thinking like a bird!)*
- What factors about the nest can help in determining the identification of its owner?

## RECOMMENDED LITERATURE:

Boring, Mel. *Birds, Nests and Eggs*. Minocqua: North Word Press, Inc., 1996.
Burton, Robert. Egg, *A Photographic Story of Hatching*. New York: Dorling Kindersley, Inc., 1994.
DeMuth, Patricia B. *Cradles in the Trees, The Story of Bird Nests*. New York: McMillan Publishing Co., 1994.
Gans, Roma. *It's Nesting Time*. New York: Thomas Crowell, 1964.
Harrison, Hal. *A Field Guide to Birds' Nests*. Boston: Houghton Mifflin Company, 1975.
Selsam, Millicent and Hunt, Joyce. *A First Look at Bird Nests*. New York: Walker & Co., 1984.
Sill, Cathryn. *About Birds, A Guide for Children*. Atlanta: Peachtree Publications, 1991.

Adapted with permission from:
Zaletel, Linda; Hollif, Rick and Brown, Beth. *Iowa Birds*. Iowa Ornithologist Union & Iowa Conservation Education Council, 1992.
*Birds: Winter and Year-Round Activities for Children*. Ithaca: Cayuga Nature Center, 1990.

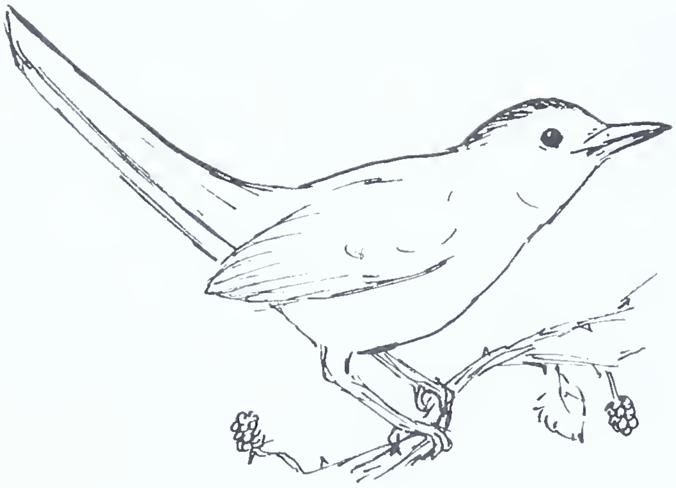
# NESTING INVENTORY SHEET

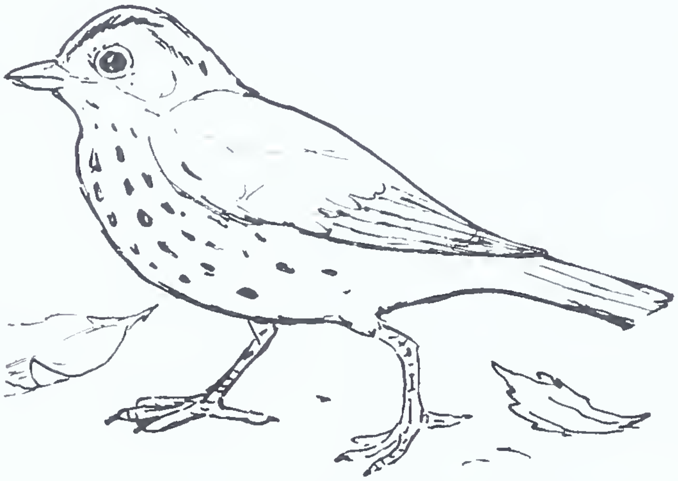
School Year ______________________________

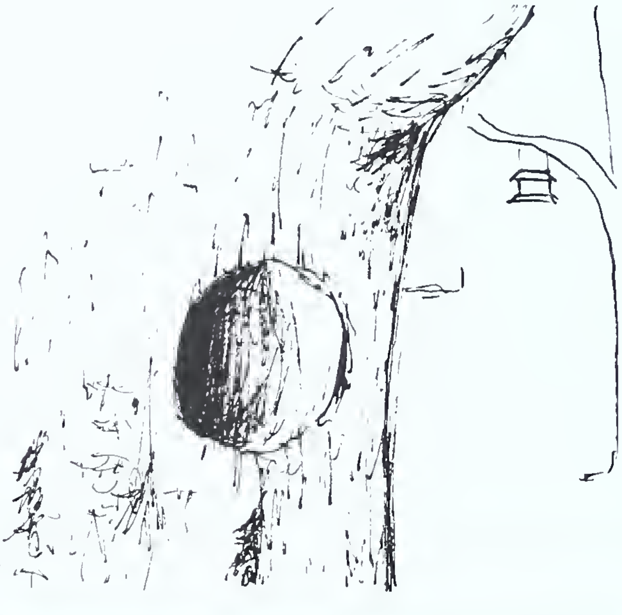
School Ground ______________________________

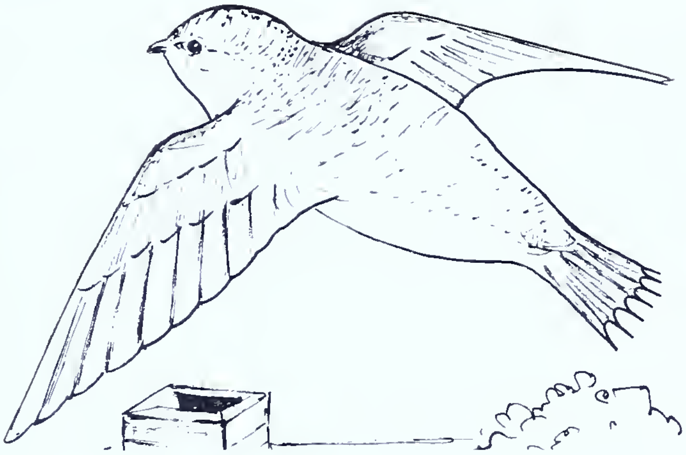
Name(s) ______________________________________________

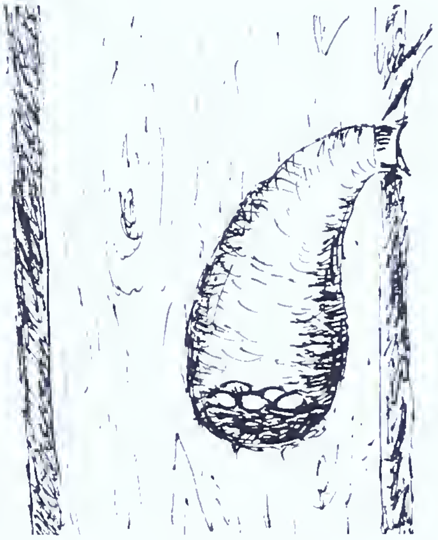
| Date | Habitat | Nest Location | Species | Shape of Nest | Height Above Ground | Materials | Songbird Nest Y/N |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

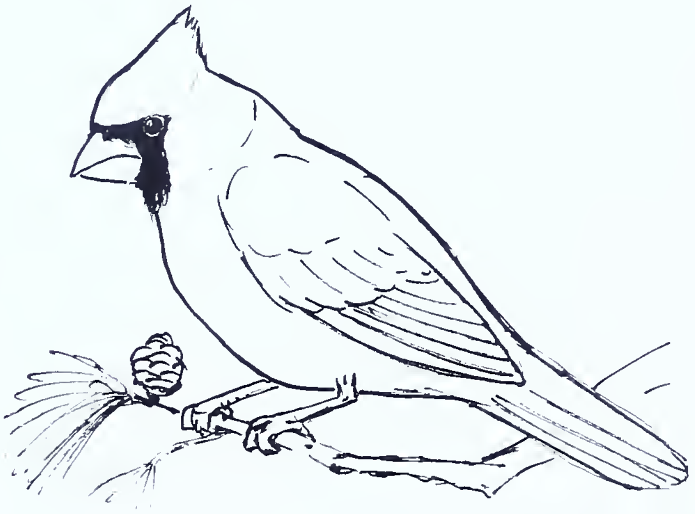


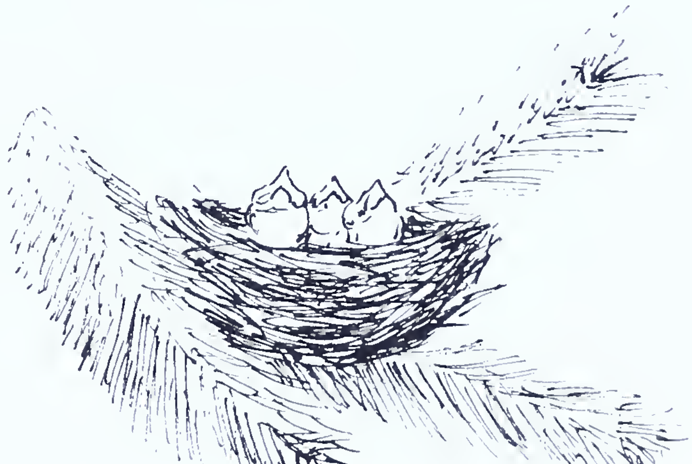


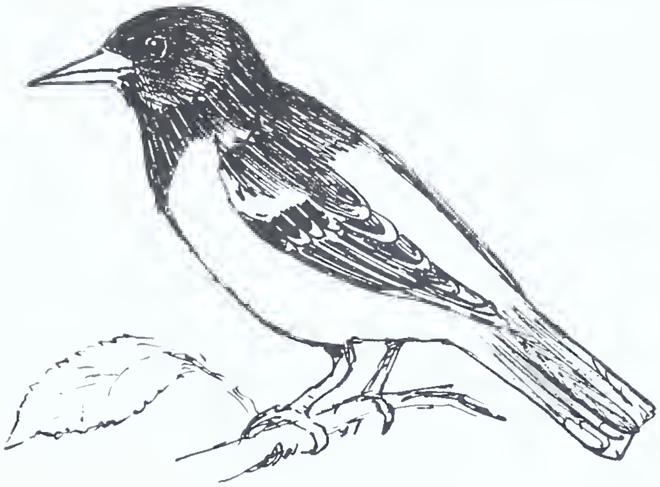


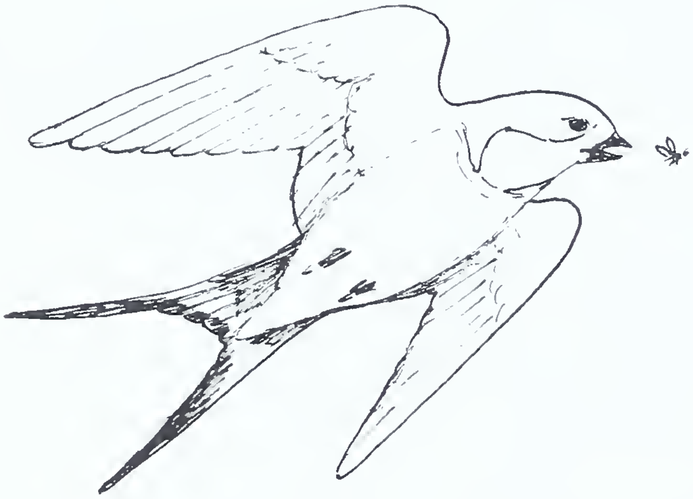


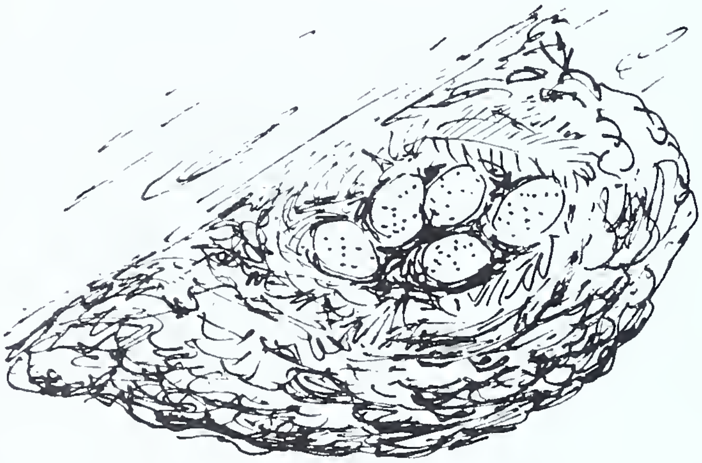


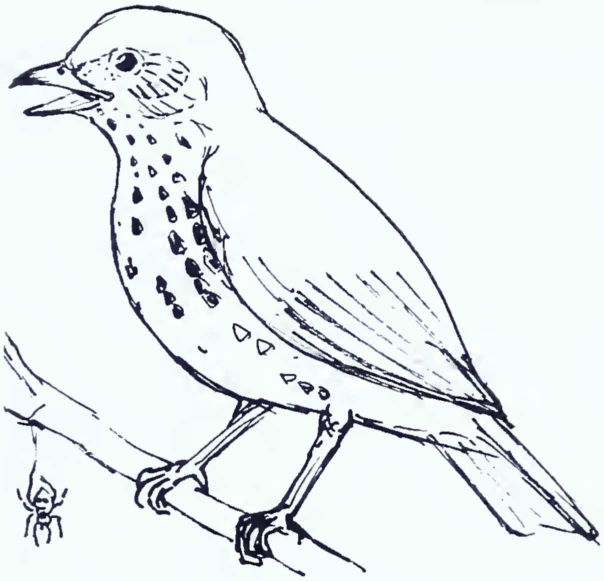


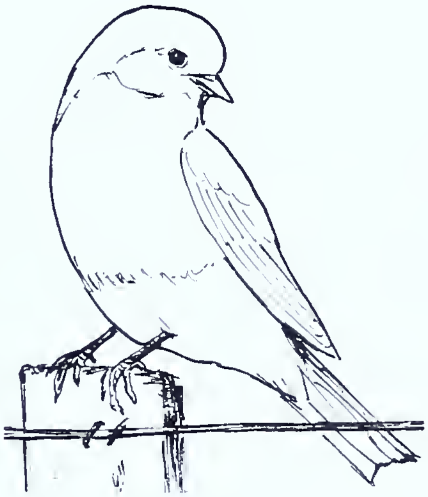


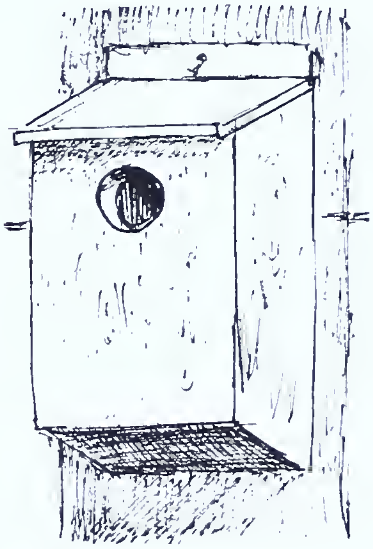


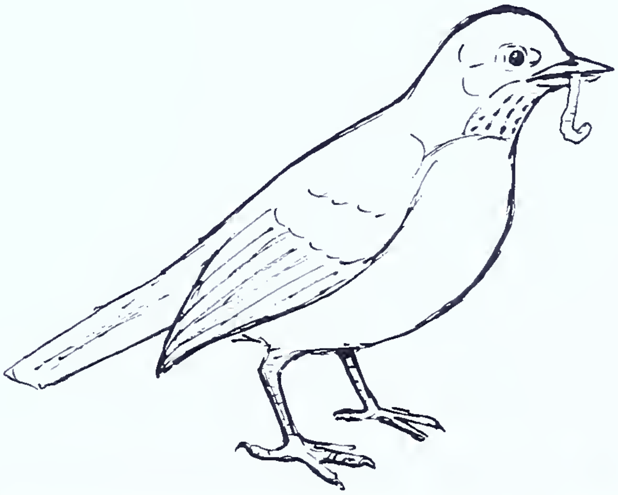












# Lesson 6

# *Build A Nest*

**Age:** Grades 3-8

**Subjects:** Science, art

**Skills:** Observation, classification, prediction, interpretation, problem-solving

**Duration:** 45 minutes

**Group size:** Up to 25

**Setting:** Indoors or outdoors

**Key vocabulary:** Clutch, egg tooth, cavity, parasitize, precocial, altricial, incubation, camouflage, brood, pipping

## OBJECTIVES:

Students will build a bird nest using the same materials a bird would use; and describe and compare the nests of several different kinds of birds.

## METHOD:

Students build a bird nest using natural materials.

## MATERIALS:

Paper or plastic bags (one per student), one bucket of water and one empty bucket (for making mud), two trowels, soil, twigs, grasses, etc., photographs of a variety of nests (from nature magazines, *A Field Guide to Birds' Nests* (Harrison) or *Songbirds and Nests* card provided in Chapter 3, Lesson 5), newspaper, one index card and pencil for each student, wire, reference page, *Bird Nest Frame Equipment Card.*

## BACKGROUND:

Birds spend varying amounts of time and energy constructing their nests. Some spend days or weeks building a nest, while others simply scrape a small depression in the soil or pile a few twigs together. Still others lay their eggs in the nests of other birds, or take over abandoned nests. It is most common for the female to work on the nest alone. However, sometimes the male alone or both the male and female are responsible for constructing the nest.

Bird nests can be classified into three categories: cavity-nesters, cup nesters, and ground nesters. Birds use a variety of materials to build their nests. The environment in which the bird lives influences the type of materials and location of the nest. Some prairie birds use grasses for nesting material and make their nests on the ground (meadowlark, bobolink, grasshopper sparrow). Some woodland birds make their nests of plant fibers, twigs and leaves, and locate them above the ground in the branches of bushes and trees (cardinal, blue jay, oriole). Other woodland birds nest on the ground (veery, ovenbird).

Some birds locate their nests inside a tree cavity (nuthatch, woodpecker, bluebird, screech owl). Whip-poor-wills, nighthawks and killdeer lay their eggs directly on the ground. Urban birds may nest in chimneys, eaves, stoplights and business signs (chimney swift, house sparrow, starling). Some wetland birds may construct nests on floating mats of vegetation (coot, pied-billed grebe, rail). Some birds, like the great horned owl, do not build their own nests but use abandoned nests of other birds (Cooper's hawk, crow) or mammals (squirrel). Cowbirds do not make their own nests but parasitize other birds' nests.

Nesting materials may include moss, lichen, plant seeds, human and animal hair, snake skins and feathers. Chimney swifts use their own saliva as binding material for nests. Some birds use mud to hold nesting materials together (barn swallow, robin). Birds also use a variety of manmade items for nests, such as yarn, plastic strips, string, paper and aluminum foil.

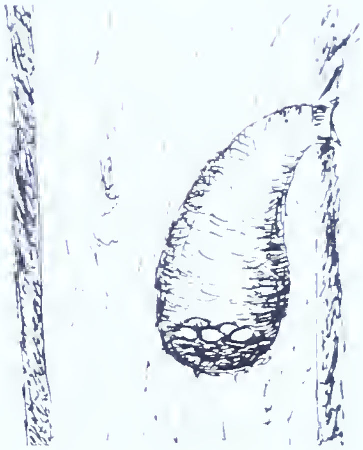
Eggs are laid over many days. A nest of eggs is called a clutch. Egg coloration and patterning can be the means of protecting eggs while the parent is away. Most birds produce many eggs with each nesting cycle. Production of a surplus is necessary as many eggs and young do not survive to adulthood.

The time between the laying of the last egg of a clutch and the last egg's hatching is called the incubation period. The length of time for incubation varies among species of birds from 10-11 days to 12 weeks.

Hatching takes several hours and may even take days. Chicks use their egg tooth, a bony tip on the top of their bill, to break through the shell. This period of time is called pipping. They start pecking at the blunt end of the shell where the air sac is located. Chicks have a special hatching muscle to help them with this task, and they take many rest breaks.

Care and protection of young birds is a time-consuming process. Some chicks are born fully feathered and able to see (precocial). They follow their parent and feed themselves soon after hatching. Birds such as pheasants and quail are precocial. Other birds are born with their eyes closed and without feathers. These birds remain in the nest to be fed by a parent. Birds such as robins and blue jays are altricial. Some birds are able to move their young, using their legs, beak or talons, if danger arises.

Raising chicks is a continuous, daily chore for the parents, with non-stop flights to gather food and clean the nest of fecal matter. In order to survive, some chicks must eat half their body weight each day and may eat thousands of insects before leaving the nest. Some birds are able to produce several broods of young each year. Imagine the time and energy involved.



Black-capped Chickadee nest

A clutch may range in size from 1 – 23 eggs.

## PROCEDURE:

1. Ask the students to study the pictures of nests or real nests to determine how they were made.
2. Challenge each student pair to build a specific type of bird nest using the same materials the bird would use. Have them refer to their activity cards and research information from *Songbirds and Nests,* if necessary.

Depending on the nest, it may be easier to start with a wire frame. Refer to *Bird Nest Frame Equipment Card*. Students should try to make the nests accurate in size and shape. Have the students use bags to collect small amounts of the materials they need from outside. (Avoid collection of living plants, such as moss, lichens and rootlets.) Have students use the trowels to mix soil and water in the buckets to make mud. Students can work on building nests outside or in the classroom, over lots of newspaper.

3. Have students use reference books and make signs for their nests on index cards: indicate the type of nest, size and location, the material used, and the species of birds that build such nests. Display the finished nests for all to admire.
4. To simulate the beak of a bird, use tweezers or only two fingers to pick up and manipulate the nesting materials. Not easy!

## EXTENSION:

- Locate and count but **DO NOT COLLECT OR DISTURB** different kinds of bird nests found outside. Who lives in each type of nest? What materials were used in the nest's construction? How far off the ground is it? (Refer to Chapter 3, Lesson 5.)
- Watch a bird build a nest. How many days does it take? How far does it fly to gather material? After watching the bird for a few hours, calculate the number of trips per day or per hour. Determine the total number of trips necessary to complete construction. Calculate the total distance flown.

## EVALUATION:

- Have each student discuss the selection and use of the materials used in making a nest. How is the nest held together? Where is the nest located in relationship to the ground? Study and compare various types of nests.
- Discuss the advantage of having a nest on the ground, by the water, in a cavity or in a tree. What is the advantage and disadvantage of each? What are the advantages and disadvantages of not building a nest?
- Some excellent discussions can follow as to why all birds don't use one type of nest construction or materials, how some birds (killdeer) don't build much of a nest at all, why some birds are nest parasites (cowbirds), and numerous other topics. Instill a new-found respect for the intricacy and beauty of nest construction.
- What difficulties did the students encounter when building the nests? How did they overcome these problems?

## RECOMMENDED LITERATURE:

Harrison, Hal. *A Field Guide to Birds' Nests.* Boston: Houghton Mifflin Company, 1975.

Adapted with permission from:
*Illinois Birds.* Illinois Department of Natural Resources, Educational Services.
*Birds: Winter and Year-Round Activities for Children.* Ithaca: Cayuga Nature Center, 1990.
*Outdoor Biology Instructional Strategies.* Lawrence Hall of Science, Delta Education.

*Bird Nests*

# BIRD-NEST FRAME

## Equipment Card

**MATERIALS**

1 two-meter length of thin wire for each participant (aluminum wire works best)*

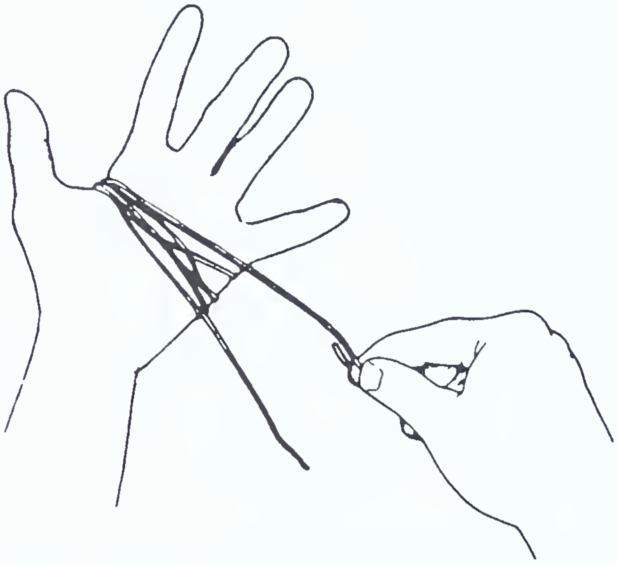
1 pair of scissors*

*Available from Delta Education.

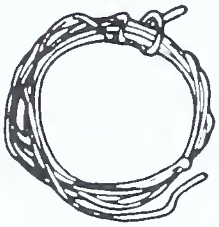
**MAKING THE FRAMES FOR THE YOUNGSTERS (INSTRUCTIONS FOR THE LEADER):**

**1.** Cut 1 two-meter length of wire for each participant.

**2.** Coil each wire into a circle approximately seven centimeters in diameter. One way to make the circle is to coil the wire around your hand.

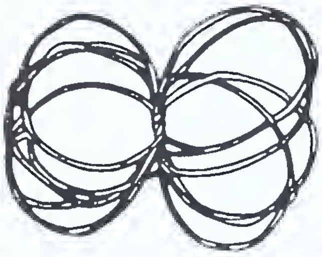


**3.** Take one loose end of the coiled wire and wrap it tightly around the coil three or four times.

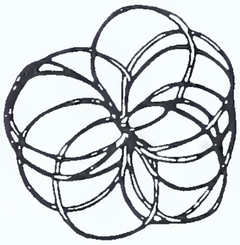


**MOLDING THE FRAME (INSTRUCTIONS FOR THE PARTICIPANTS):**

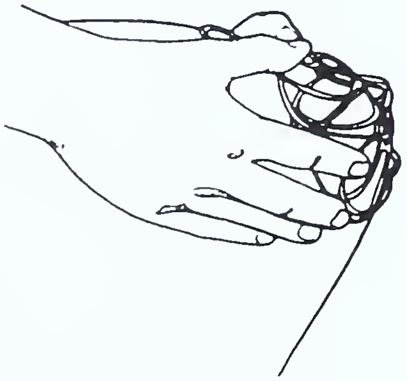
**1.** Separate the coil into two circles, forming a figure eight.



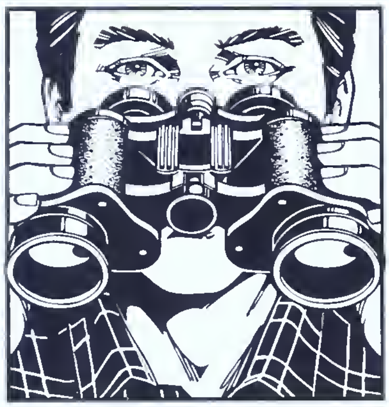
**2.** Spread the coils out into a flat flower shape.



**3.** The frame can then be molded into a nest shape by pressing it against a bent knee or the toe of a shoe.



**4.** Materials can now be woven into or molded on the frame.



# Lesson 7

# *Taking A Closer Look*

## OBJECTIVE:

Students will explain the use of blinds and give some examples of ways to make blinds.

## METHOD:

Students construct and use a blind to observe birds or other wildlife.

## MATERIALS:

Cardboard, burlap, camouflage material—varies.

## BACKGROUND:

Scientists learn a lot from observing wild animals in their natural habitat. However, sometimes it is necessary to get rather close to the animals to make the desired observations. Using binoculars does help, but sometimes they are not enough. Often animals will respond to the presence of humans, whether they are very close or using binoculars from a distance. In these situations the use of a blind is helpful.

A blind helps a person hide from an animal while at the same time providing a view of the animal. Blinds come in many different shapes and sizes. They may be simple or complex, made of natural materials or synthetic. A blind could be a hole in a fence, a cardboard box, a tent with a viewing window, a lean-to disguised with brush. Blinds can be portable or fairly permanent. It all depends on the purpose and nature of the blind. Some scientists and photographers make blinds that resemble a muskrat lodge or a brush pile. The most important aspect of a blind is that it provides an area where a person can make observations without interfering with the species being observed.

When you are ready to use a blind, it is best to make it rather unobtrusive. The blind should be set up a day or two before you are ready to use it so that animals can get used to and accept it as part of the habitat.

**Age:** Grades 4-12

**Subjects:** Science, art, industrial arts

**Skills:** Design, observation, research

**Duration:** Initially one class period, short session during other class time

**Group Size:** Any

**Setting:** Indoors and outdoors

**Key vocabulary:** Blind, observation

## PROCEDURE:

1. Bring up the idea of a bird blind with the students. Have they ever seen or used one? What would be the benefits of using a blind to observe birds in an area?
2. Ask students to research some simple designs of blinds. A good reference is *Secrets of a Wildlife Watcher* by Jim Arnosky. Divide students into groups and have them design a simple, inexpensive blind they could use to observe birds in the schoolyard or another designated area. Although blinds are usually associated with outdoors, students who have bird feeders at a window may want to come up with a way to make windows less obtrusive and dangerous to birds. (Birds often fly into windows because of reflections.)
3. Have groups present their designs and explain how their blind could be used, where it could be placed, etc.
4. Have students construct their blinds and use them to make and record observations of the songbirds and other wild animals over a period of time.
5. Ask students to summarize their observations and present their findings.

## EXTENSION:

- Students observe an area for songbirds for a week or two without a blind, then use a blind and compare and contrast findings.
- Class designs and builds a permanent blind for use by all students at the school.

## EVALUATION:

- Students explain the use of blinds and how they are helpful to scientists in gaining information about wildlife. Students explain how their blinds helped them in their observations of wildlife in their area.

## RECOMMENDED LITERATURE:

Arnosky, Jim. *Secrets of a Wildlife Watcher.* New York: Beech Tree Books, 1991.

Activity developed by:
T. Alberici, Pennsylvania Game Commission, Harrisburg, PA, based on ideas presented in *Secrets of a Wildlife Watcher* by Jim Arnosky.

# Lesson 8

# *Wild Words...A Journal For The Birds*

## OBJECTIVE:

Students will observe and describe songbirds in their habitats in a variety of ways.

## METHOD:

Students go into an outdoor setting to make and write in journals they design.

## MATERIALS:

Construction paper for journal covers, blank, unlined writing or computer paper, staples and stapler; marking pens, crayons, pencils.

**Age:** Grades 4-12

**Subjects:** Language arts, science

**Skills:** Description, discussion, drawing, media construction, observation, visualization, writing

**Duration:** One 20 to 45-minute period (recommend using the journal produced through this activity as a place for recording data, observations, images, etc., in other activities)

**Group size:** Any

**Setting:** Outdoors

**Key vocabulary:** Journal, observation, naturalist

## BACKGROUND:

A naturalist is a person who studies nature, especially by direct observation of plants, animals and their environments. Naturalists often spend a lot of time outdoors, and they often record their observations in some form. They may use sketches, drawings, paintings, photographs, poetry and prose to record their thoughts and observations. Most people view naturalists as found only in natural or wild areas. But naturalists can work anywhere from cities to small towns, suburbs to farms, as well as in natural areas. Each person's motivation will be unique and may include the sheer joy of learning more about natural systems, interest in contributing to scientific research, love for the art of writing as literature and simple satisfaction of being outside. A naturalist's journal is usually a combination of accurate observations about the plants, animals and environment around him or her, almost like a biologist's field notes, and expressions of personal thoughts, comments, feelings or questions inspired by experience.

People today benefit from the insights and observations of those who have delighted in, and been fascinated by, the wonders of the natural environment—Henry David Thoreau, John James Audubon, Walt Whitman, Enos Mills, John Muir, Edward Abbey, today's Gary Nabhan, Terry Tempest Williams and Annie Dillard are among those who have captured their insights in words and offered them to others.

Most of the naturalists who put their observations in poetry and prose carry with them a small journal as they wander the woods, streams, lakes, oceans, deserts and other environments. Ned Smith, artist and journalist, kept diaries of his experiences in the mountains and along the rivers of his native Pennsylvania. A book entitled *Gone for the Day* (Harrisburg: Pennsylvania Game Commission, 1971) shares some of his writings and sketches done in the 1960s. A June 5 entry reads:

> "Victor and I were watching the comings and goings at his purple martin house and I commented on several males returning with green leaves which they placed in their nests. 'They do that all the time,' Victor assured me. 'See how they've cleaned the leaves off of that Chinese elm over there?' Sure enough, the elm tree he pointed out bristled with bare twig ends stripped of the terminal three or four leaves by the martins. Do the leaves serve to cool the nest? Are they part of the nesting material? Are they meant to be decorative? No one seems to know the answer."

The major purpose of this activity is for students to learn to express and record their observations of nature and specifically songbirds, in a variety of ways.

## PROCEDURE:

1. Provide students the opportunity to observe birds in their environment. Ideally, students will be able to go outside to some pleasant outdoor setting. It might be an open area on the school grounds with clear sky above, near a large and inviting tree in a park that shades the earth on a hot day, or any outdoor setting, from the immediate school grounds to a city park to a remote, wilderness setting. However, a comfortable seat by a window will work as well.
2. Ask the students to sit quietly, listening carefully for any sounds. Students might look with "soft eyes" and "hard eyes." Hard eyes are good for looking closely at a squirrel running up a tree. With soft eyes, students scan an area without focusing on any one thing. Soft eyes are good for seeing all the trees, the sky, the ground in an area—noticing the squirrel moving out of the corner of one eye, a bird moving skyward out of the corner of the other eye, and feeling the warmth of the sun from above. Encourage the students to try both hard and soft eyes, noticing the differences in how they feel and what they see. This soft and hard concept can also be used for hearing. Hard ears will focus on one or two sounds or voices. Soft ears explore the rhythm or flow of the sound.
3. Talk with the students about what they see, feel and notice. Read an excerpt from the writings of a naturalist. A children's book for young and old students, *Another Way To Listen,* by Byrd Baylor and Peter Parnell

(New York: Charles Scribners Sons, 1978) is an excellent way to set a mood and encourage greater awareness of natural surroundings. It includes: "I used to know an old man who could walk by any cornfield and hear the corn singing. . .. 'Were you surprised to hear it?' I always had to ask. He said, 'Not a bit. It seemed like the most natural thing in the world.'" For older students, any excerpts from *The Wilderness World of John Muir,* edited by Edwin Way Teale (Boston: Houghton Mifflin Company, 1954) are good. For example, the chapter, "Windstorm in the Forest," is Muir's accounting of climbing a tall tree during a windstorm:

> "It occurred to me that it would be a fine thing to climb one of the trees to obtain a wider outlook . . .. Under the circumstances, the choice of a tree was a serious matter. Being accustomed to climbing trees in making botanical studies, I experienced no difficulty in reaching the top of this one, and never before did I enjoy so noble an exhilaration of motion. The slender tops fairly flapped and swished in the passionate torrent, bending and swirling backward and forward, round and round, tracing indescribable combinations of vertical and horizontal curves, while I clung with muscles firm braced, like a bobolink on a reed."

4. Get out construction paper and blank unlined writing or computer paper for the students to make their own journals. Simply fold the paper in half with the construction paper on the outside and the unlined paper inside. Staple along the seams so that the booklet stays together. Provide marking pens and crayons so the student can put his or her name, a title and a drawing on the cover. Or, make or buy more durable journals before going out to start using them.
5. Give the students some time (about 15 minutes is fine to begin) to become accustomed to using the journal. Structured activities can be inserted at this point, or, each can find a quiet place to make a drawing of something seen. The students could begin to write a few words of description or a poem describing their feelings about being outside in that place at that time. The important thing to stress is that the journal belongs to each of them to fill with whatever they choose. It is not the same thing as a diary that might be written in every day. It is a special way to keep memories and ideas about things in the environment. Encourage them to take their journals with them sometimes when they are outside, and regularly if possible perhaps tucked in a backpack or a purse. It is especially good for those times when they are alone outside—perhaps walking to and from school, at a park over a weekend, on a camping trip with family members, etc. One of them may be the next John Muir or Annie Dillard! Whenever possible, provide time and situations for students to use their journals.
6. Discuss the value of journals. In addition to recording impressions, feelings and observations, a journal can become a log of important data

to be referred to later. It can reflect changes in ecosystems, vegetative types, animal populations—as well as attitudes about things. It can hold images as well as words. It can even hold artifacts from leaves to grains of sand!

## EXTENSIONS:

- Have students observe school grounds over a long period of time--throughout the year, over the course of a month, etc. Have them record in their journal. Using excerpts from each students' journal, compile a class journal.
- Have students choose a species of bird to observe through the seasons or through a breeding season, recording their observations, feelings, etc. in their journal. (If the bird migrates, students can write a birds-eye view of where their bird might migrate and the experiences it may encounter.)

## EVALUATION:

- After a designated time, have students summarize some of their observations, feelings, comments, etc. that they recorded in their journal and explain how keeping their journal may have contributed to knowledge and appreciation of the environment.

Adapted with permission from:
Project WILD. *Project WILD K-12 Activity Guide,* "Wild Words . . . A Journal Making Activity." Council for Environmental Education. © 1983, 1985, 1992.
Journal Entry from: *Gone for the Day* by Ned Smith. Pa Game Commission, © 1971.

# Background

At least two-thirds of North American birds migrate short or long distances each fall. Not all songbirds migrate; some, such as chickadees, cardinals, and titmice, reside in their chosen locales year-round. Other songbirds, such as robins, are short-distance migrants that travel no further than is necessary to find food. There are many long-distance migrants include warblers, flycatchers, vireos and tanagers. Most migratory birds are predators, feeding on insects, worms or crustaceans. They head for places that don't freeze and limit their food availability. Seed-eating birds such as sparrows and cardinals don't feel the pressure to migrate great distances since their food is readily available year round.

Of the approximately 660 species of birds that breed in North America, approximately 350 species leave here in late summer/early fall for the balmy regions of Mexico, Central America, South America and the Caribbean. Those species that head south of the border are known as "neotropical migratory birds" and include raptors, waterfowl, shorebirds and songbirds. "Neo" refers to the "new" world, or the America, and "tropical" refers to the latitudinal area between the Tropics of Cancer and Capricorn. Hummingbirds, catbirds and broadwinged hawks are just a few of our neotropical migrants.

The blackpoll warbler makes a round trip of 5,000 miles every year, primarily from New England and Canada to its winter home in the Amazonian rainforest in northern South America. (East to west across Pennsylvania is 302 miles.) Birds are amazingly light. A blackpoll warbler, which weighs the equivalent of two quarters (0.5 ounces, 14 grams), was confirmed for the first time nesting in northeastern Pennsylvania in 1995 by two well-known state ornithologists. Boreal forests are the primary breeding habitat for this species.

The vast majority of birds in North America show some sort of migratory movements during the annual cycle – neotropical migrants trek to the tropics, short-distance migrants travel to the southern United States, and so-called permanent residents often exhibit regional movements in response to prevailing local weather.

## Why Migrate?

Scientists are still not sure *why* birds migrate. One reason may be the large numbers of insects found in the northern climates during the longer days of summer, allowing birds to raise more young. Another theory is that migrating birds are heading back to their ancestral homes.

Many neotropical migratory species are thought to have originated in the tropics. Their yearly forays to the temperate zone may have developed as a means of taking advantage of the seasonal availability of food resources. Migration is known to be linked to the length of the day. Increasing and decreasing daylight trigger a release of hormones that stimulates the migratory urge. The migration of long-distance migrants correlates with day length but short-distance migrants tend to respond strongly to weather events, such as strong low pressure systems and favorable winds. To better appreciate this annual schedule, begin by keeping a calendar of the backyard birds that return yearly to your part of the state. Correlate the arrival of the species with the weather patterns and temperature to see what influences these may have.

*How* birds migrate is as much a mystery as *why* they migrate. Methods of navigation vary among species from the use of land forms as markers to directional clues from the sun and stars. No one method is used by all species. For example, daytime migrants such as geese, shorebirds, chimney swifts, barn swallows and robins use the angle of the sun's path across the sky to discern their direction. Night flyers (some of the small insect-eating birds such as warblers, vireos, grosbeaks and buntings) use star patterns and the earth's magnetic field to navigate. Safety from predators and dehydration are also reasons why these birds head out at night. While in flight, birds may use geographic landforms to help orient direction and course.

Many scientists believe that migratory birds tune into the earth's magnetic field in combination with gravity for direction. Birds live in a sensory world very different from our own. Homing pigeons and some migratory birds can see ultraviolet and polarized light and hear ultralow frequencies of long wavelength. These frequencies resonate far below the realm of the human ear, and typically include sounds produced by such things as surf hitting beaches and thunderstorms. Some have been known to detect minute changes of barometric pressure that aid in the "decision" as to when to travel with respect to weather conditions. When looking at a map, one can clearly see how the direction of mountains, rivers, and shape of North American coasts can aid in north/south migration.

## How Do We Know Where They Go?

How do ornithologists (scientists who study birds) know what routes birds take and where they end up? By banding a bird with an aluminum or plastic leg band stamped with a serial number (see Chapter 5 for additional information on bird-banding), many interesting facts have been learned. For example, many migratory species seek out the same area where they wintered or summered the year before, sometimes returning to the same tree.

## Birds On The Decline

Numerous studies have indicated declines in populations of many migratory birds. A variety of factors impact bird populations throughout their range including pesticides, power lines, parasitism by cowbirds and predation by small mammals. However, the most significant factor impacting bird populations is due to human activities causing: loss and fragmentation of habitat across the breeding grounds in the United States and Canada, loss and degradation of stopover sites used while on migration, and destruction of wintering ground habitat throughout Mexico, Latin America and the Caribbean.

## Habitat Fragmentation

While the overall reduction of habitat has significantly impacted bird populations, habitat fragmentation, or the dividing of large habitat tracts into smaller areas, has had far reaching impacts, particularly on successful nesting of many species. Fragmentation of once-large forested areas increases the amount of "edge" habitat in a given area. Increased edge makes birds more vulnerable to suburban predators, including opossums, raccoons, cats, blue jays and crows. The open spaces in fragmented forest landscapes also attract the brown-headed cowbird, a brood parasite that lays its own eggs in the nests of many neotropical migrants, and further reduces their reproductive success. (See Chapter 6, Lesson 5.) Feral (or free-roaming) cats are estimated to kill three to four million birds each **day** in the United States.

Very little is known about the ecological and habitat requirements of migratory birds along their migration routes.

## Habitat Loss On Wintering Grounds

Tropical forests provide the winter home to hundreds of migratory species that breed in the United States and Canada. Tropical forests worldwide continue to be eliminated at the rate of nearly 50 acres each minute, amounting to an area the size of Cuba each year. In Latin America the rate of deforestation is about ten times as great as the rate of reforestation. The land mass inhabited by migrants in winter is much smaller than the vast breeding area of North America. Because of the reduced land area available to northern migrants in wintering versus breeding grounds, the destruction of 100 acres of habitat in the tropics may have the same effect as a 1000-acre loss of forest in the north.

## Conserving Migratory Birds

Although populations of a variety of migratory birds are declining, many migratory bird species are still abundant. A national and international initiative called Partners In Flight is working to protect and conserve our birds by striving to "keep common birds common."

Here are three ways to help:

1. Join the *Partners In Flight* mailing list to keep educated and informed. Write to: Partners In Flight, National Fish And Wildlife Foundation, 1120 Connecticut Avenue NW, Suite 900, Washington, DC 20036.
2. Participate in International Migratory Bird Day, held the second

Saturday in May. Organizer and educator packets are available. Contact Pennsylvania's state coordinator, Alan Gregory, for more information at P.O. Box 571, Conyngham, PA 18219.

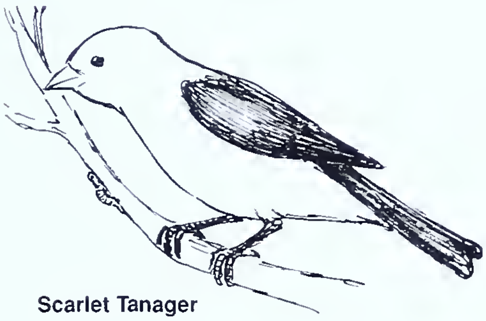
3. Celebrate Pennsylvania Bird Day, March 21.

For more information on those birds that migrate and their distribution, see the Appendix.

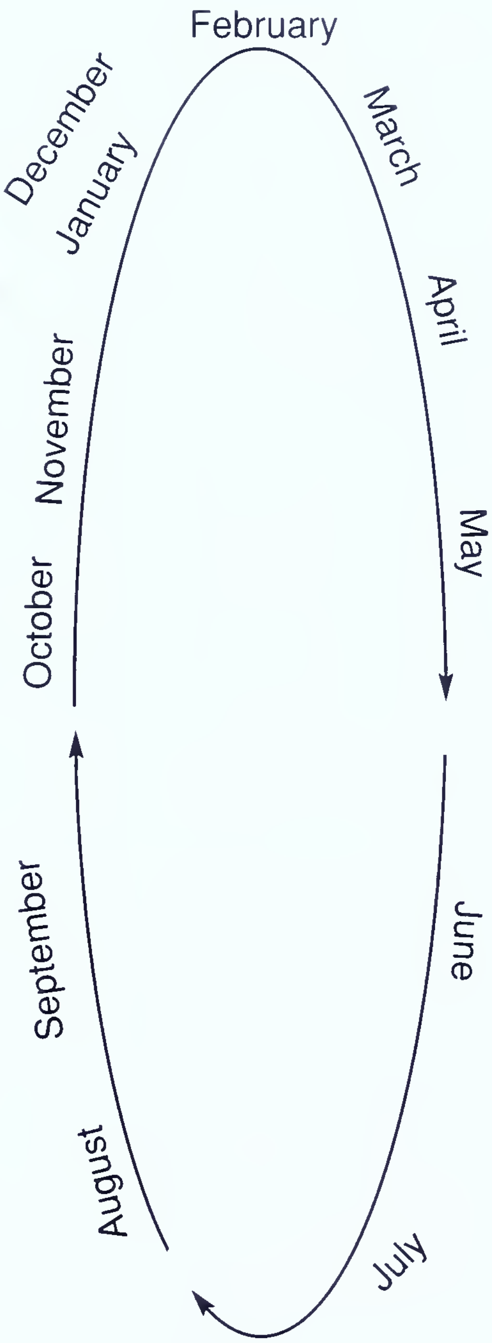
*See Bibliography for references.*

## A YEAR IN THE LIFE OF THE SCARLET TANAGER

Scarlet tanagers can be found throughout Pennsylvania. They live in forests and woodlots and spend the majority of their time high in the canopy. Very often these birds are around but not necessarily seen. During breeding season, the male is a bright red with black wings. After nesting, the male molts into a duller olive-yellow but retains the black wings. Females and immatures are dull olive and yellowish overall. Scarlet tanagers are considered long distance neotropical migrants that winter in South America.



**Scarlet Tanager**



Birds gear up to migrate north.

Males return in full breeding plumage and start to establish territories.

Females return and look for mates.

Female is sitting on her nest. Occasionally the male will stop by and feed her. (Eggs are pale bluish, speckled with brown; 3-5 per clutch.)

After 13 days, young hatch and remain in the nest for another 13 days. Females feed young, males will help with feeding chores.

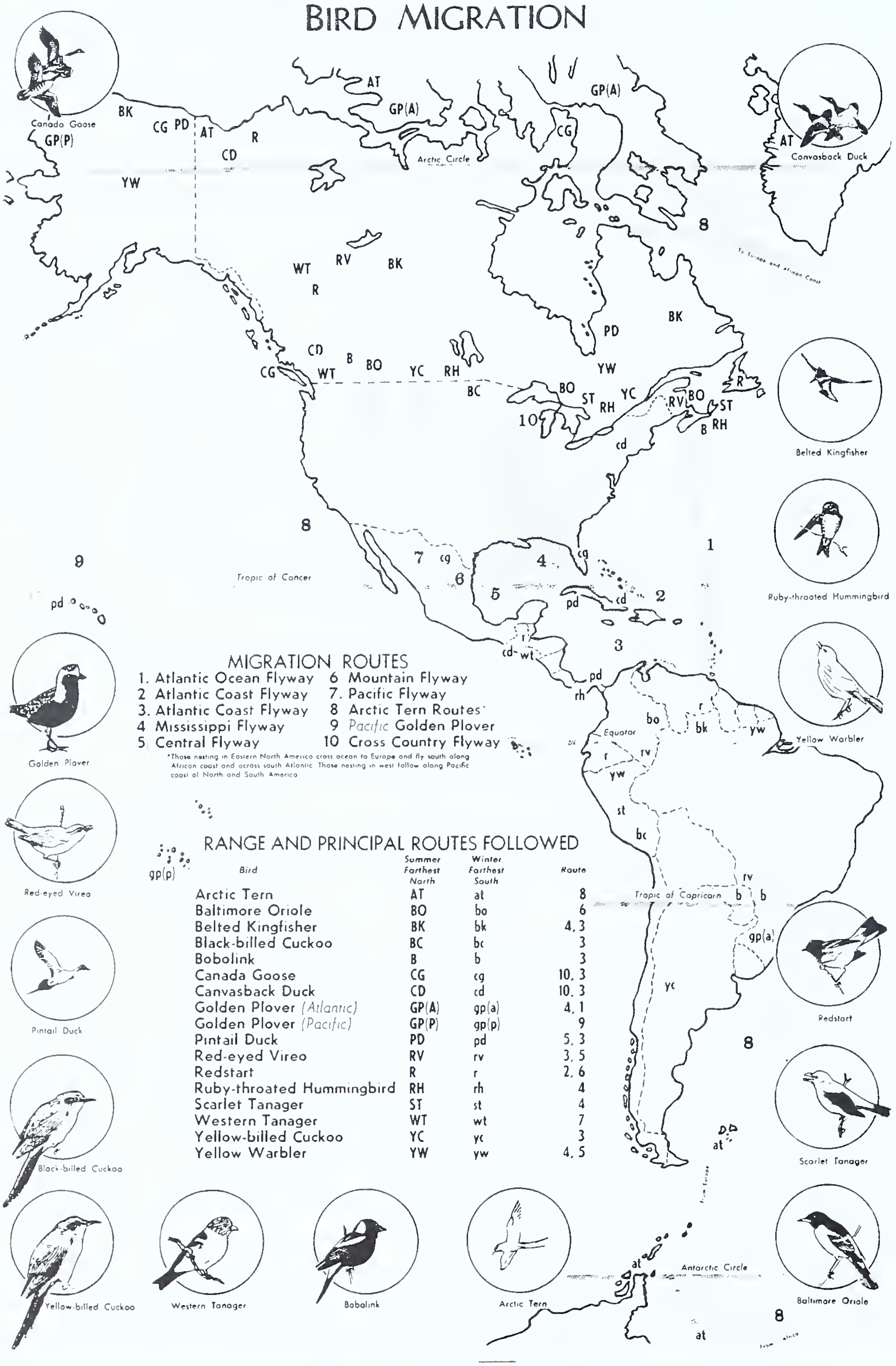
Young are out of nest and pretty much on their own.

Birds gearing up for migration.

Birds migrate to South America.

Birds overwinter in South America.

# BIRD MIGRATION



## MIGRATION ROUTES

1. Atlantic Ocean Flyway
2 Atlantic Coast Flyway
3. Atlantic Coast Flyway
4 Mississippi Flyway
5 Central Flyway
6 Mountain Flyway
7. Pacific Flyway
8 Arctic Tern Routes*
9 *Pacific* Golden Plover
10 Cross Country Flyway

*Those nesting in Eastern North America cross ocean to Europe and fly south along African coast and across south Atlantic. Those nesting in west follow along Pacific coast of North and South America

## RANGE AND PRINCIPAL ROUTES FOLLOWED

| *Bird* | *Summer Farthest North* | *Winter Farthest South* | *Route* |
|---|---|---|---|
| Arctic Tern | AT | at | 8 |
| Baltimore Oriole | BO | bo | 6 |
| Belted Kingfisher | BK | bk | 4, 3 |
| Black-billed Cuckoo | BC | bc | 3 |
| Bobolink | B | b | 3 |
| Canada Goose | CG | cg | 10, 3 |
| Canvasback Duck | CD | cd | 10, 3 |
| Golden Plover *(Atlantic)* | GP(A) | gp(a) | 4, 1 |
| Golden Plover *(Pacific)* | GP(P) | gp(p) | 9 |
| Pintail Duck | PD | pd | 5, 3 |
| Red-eyed Vireo | RV | rv | 3, 5 |
| Redstart | R | r | 2, 6 |
| Ruby-throated Hummingbird | RH | rh | 4 |
| Scarlet Tanager | ST | st | 4 |
| Western Tanager | WT | wt | 7 |
| Yellow-billed Cuckoo | YC | yc | 3 |
| Yellow Warbler | YW | yw | 4, 5 |

Source: *National Audubon Society*

# Lesson 1

# *Geography Is For The Birds*

## OBJECTIVE:

Students will recognize that migrating birds follow and depend upon specific routes.

## METHOD:

Students chart the paths of four Pennsylvania birds using an atlas and specific migratory directions.

## MATERIALS:

Migration directions (provided), map worksheet (provided), atlases for each student or student group, ruler for each student, bird field guides for student groups.

## BACKGROUND:

Before the northern winter begins and food becomes scarce, neotropical songbirds migrate south. Fueled by stored energy and whatever food they may find along the way, songbirds travel long distances along specific routes, sometimes losing half of their body weight on the trip.

These long-distance migrants find their way southward using the stars, orienting by the sun at dusk, monitoring wind direction, sensing the flux of magnetic fields, and tracking major topographical features such as coastlines. Most songbirds migrate at night, although if morning comes and a bird is over water, it must keep flying to land.

## MOTIVATIONAL ACTIVITY:

Ask students to run in place as fast as they can for one minute. Ask them how long they can keep running at that pace. Can they imagine running as fast as they can for 80 hours straight? Explain that, in terms of physical endurance, this is equal to the 4,000-kilometer or 2,500-mile flight over water from New England to South America made by the blackpoll warbler.

**Age:** Grades 5-8

**Subjects:** Science, social studies

**Skills:** Organizing, analyzing, and interpreting data

**Duration:** One 40-minute class period

**Group size:** One or more, alone or in small groups

**Setting:** Indoors

**Key vocabulary:** Migration, atlas, stopover areas

If a blackpoll warbler were burning gasoline instead of reserves of body fat during migration, it would get 720,000 miles per gallon.

## PROCEDURE:

1. Give each student or student group: a map worksheet, ruler, the migration directions and an atlas.
2. Instruct each student to follow the migration directions and track the fall migratory paths of all four birds. Students should mark points on the map worksheet and connect the dots, using a different color for each bird, if possible:
3. Ask older students to measure the distance of each migratory route (see map answer guide). Assume each bird flies at 20 miles per hour and takes three weeks to complete its migration. How many hours per night must each bird fly? Remember that this average is somewhat misleading because birds will sometimes rest for a night, stop for longer than a day to feed, or fly nonstop over water.

The ruby-throated hummingbird weighing only as much as a penny, makes a 1,000 km, 24 hour spring flight across the Gulf of Mexico from the Yucatán Peninsula to the southern coast of the United States.

## EXTENSION:

- Research the geographical features and habitats along the flyways of the broad-winged hawk, acadian flycatcher, scarlet tanager and yellow-billed cuckoo.
- Discuss students' travel experiences. What good and bad things might happen on a planned family trip? What might occur on a bird's journey? Have students write journal entries of the experiences a migratory bird might have en route to/from the Tropics.
- Ask students to plot the routes of other birds on the Songbird Flash Cards (see Appendix) using field guides and other resources to determine possible paths.
- Gather news articles about the places mentioned in the mapping exercise.

## EVALUATION:

- Discuss the migratory routes and tropical destinations of these birds. Consider the impact of habitat destruction along their stopover points and in their winter homes in the tropical forests. What happens if the birds find no food or resting places at a needed stopover? *(Birds that cannot find enough food may perish or reach their destinations too weak to thrive or reproduce.)* Individual birds accustomed to specific locations generally do not survive when those areas are developed or disturbed. Why? *(Other potentially suitable locations will already be occupied by other birds.)*

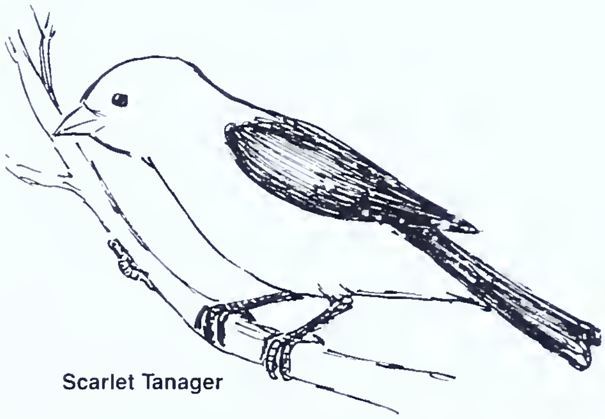
Adapted with permission from:
*Songbird Connection.* New Jersey Conservation Foundation, 1994.

# MIGRATION DIRECTIONS

**Broad-winged hawk.** This common woodland hawk soars in flocks on rising thermals, or kettles, of warming air during the morning. It migrates during the day, feeding along its route, and rests during the night. Follow this bird southwest from Hawk Mountain Sanctuary in eastern Pennsylvania along the Kittatinny Ridge, passing by (A) the capital of Pennsylvania, (B) Beckley, West Virginia, and (C) Bluefield, Virginia. Then continue south along the Cumberland Plateau through (D) Oak Ridge, Tennessee, and (E) Decatur, in the state where the yellow-shafted flicker is the state bird. Pass by (F) the capital of Mississippi, continue southwest, and cross the Mississippi River. Pass over (G) Alexandria, Louisiana, on the Red River and cross the state border at the Sabine River. Fly just south of (H) San Antonio, Texas, into the neighboring country. Follow the eastern Sierra Mountains southward toward (1) the city of Monterey, Mexico. Fly over (J) Puebla, and then head southeast towards (K) the capital of Nicaragua. The broad-winged hawk will winter here west of the Central American mountain chain. Prey will be plentiful for this raptor in the seasonal dry forest of northwestern Nicaragua!

**Acadian flycatcher.** The Acadian flycatcher eats during the day and migrates at night. It stocks up on Pennsylvania insects before heading south. Follow it over (A) the home of the Liberty Bell in Pennsylvania and head south to (B) the city in Maryland whose name is the type of oriole that is the state bird. Pass over (C) our nation's capital and head toward (D) Roanoke, Virginia. Go over (E) Winston-Salem, North Carolina, and fly by (F) Greenville in the state whose state bird is the Carolina wren. Then fly past (G) Macon in the state whose state bird is the brown thrasher. Pass over (H) the capital of Florida and head for Mexico. Stop briefly at (I) the northeast tip of the Yucatan Peninsula and then take off over (J) the island of Cozumel. Land on (K) the Mosquito Coast of Honduras and continue down the Atlantic coastline of Nicaragua. Cross the San Juan River into Costa Rica and settle down just south of (L) Tortuguero. Spend the winter in Tortuguero National Park, where the Acadian flycatcher will be in a protected rainforest reserve with an abundant supply of insects.

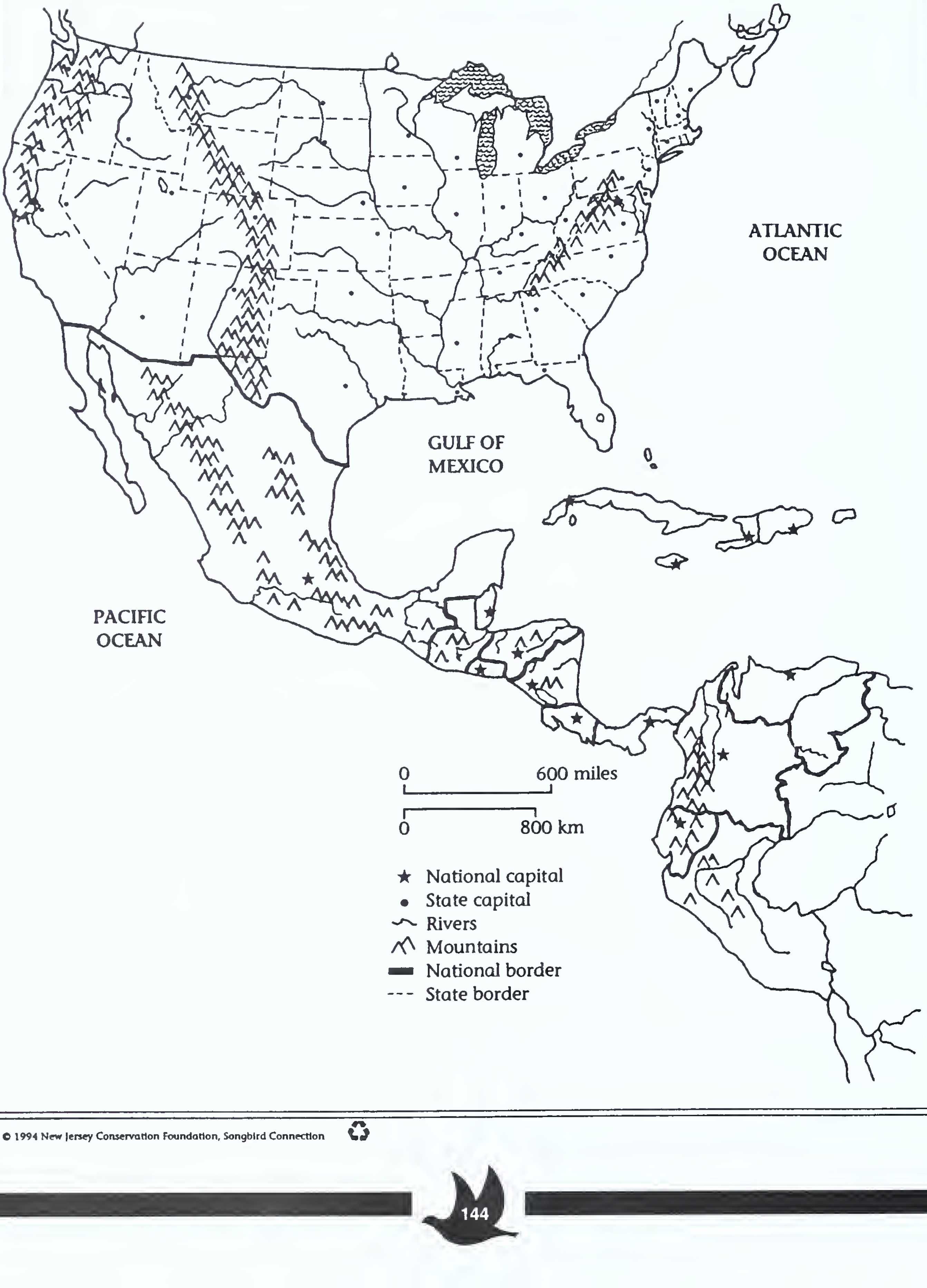
**Scarlet tanager.** The scarlet tanager eats during the day and migrates at night. Head south along the Susquehanna River (A) toward the Chesapeake Bay. Then fly to (B) the capital of Maryland. Continue south, flying just west of (C) the capital of Virginia. Pass by (D) Greensboro, North Carolina, and (E) the capital of South Carolina. Stay west of Savannah, Georgia, and cross (F) the Okefenokee Swamp. Continue south over Florida to the Gulf of Mexico and pass to the west of (G) St. Petersburg, Florida. Then head south to (H) the capital of Cuba. Stop to rest on (I) the Isla de la Juventud before heading for (J) the Cayman Islands. Then cross the Caribbean Sea to Panama and make landfall on (K) Barro Colorado Island and in Lake Gatun. Continue south over the Pacific Ocean and head east at the equator. Spend the winter months in Ecuador along (L) the Rio Napo in the Amazon rainforest just west of Peru.


Scarlet Tanager

**Yellow-billed cuckoo.** The yellow-billed cuckoo eats during the day and migrates at night. Head south over the Delaware Bay toward (A) the capital of Delaware. Follow (B) the Delmarva Peninsula south and cross the Chesapeake Bay to (C) the capital of Virginia. Fly over (D) the capital of North Carolina. From there follow the coastline to (E) the capital of South Carolina. Continue south to (F) Savannah, Georgia, and (G) Jacksonville, Florida. Follow the Florida coastline to (H) Miami and cross the Straits of Florida heading eastward toward (I) Guantanamo, Cuba. Fly over (J) Port-au-Prince, Haiti, on the island of Hispaniola and cross the Caribbean to the coast of Colombia. Head south over (K) the capital city of Colombia. Spend the winter in (L) the Colombian rainforest just north of the Rio Putumayo in the state of Amazonas.

# Geography Is for the Birds

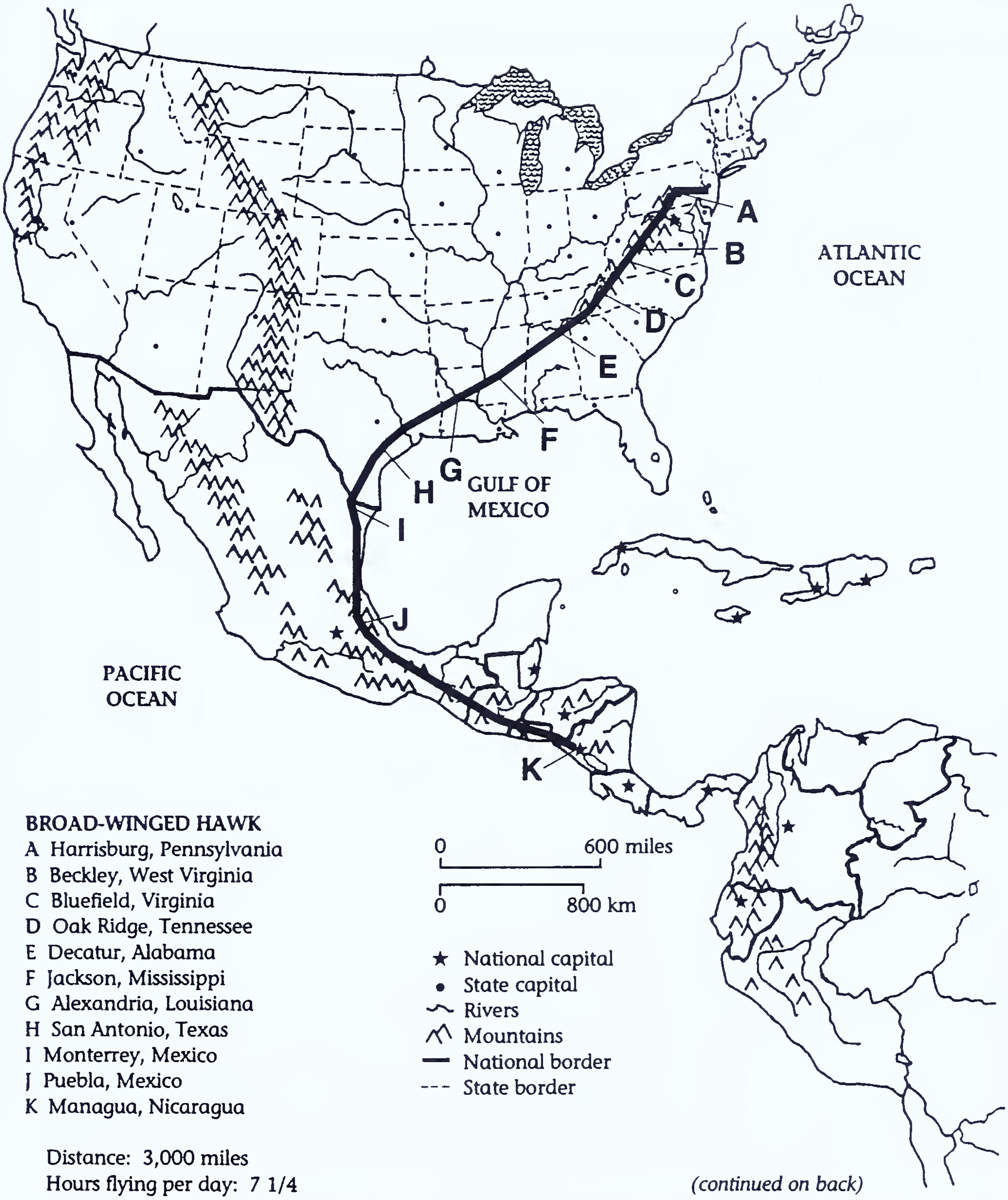
MAP WORKSHEET



© 1994 New Jersey Conservation Foundation, Songbird Connection

# Geography Is for the Birds

## MAP ANSWER GUIDE



**BROAD-WINGED HAWK**

A Harrisburg, Pennsylvania
B Beckley, West Virginia
C Bluefield, Virginia
D Oak Ridge, Tennessee
E Decatur, Alabama
F Jackson, Mississippi
G Alexandria, Louisiana
H San Antonio, Texas
I Monterrey, Mexico
J Puebla, Mexico
K Managua, Nicaragua

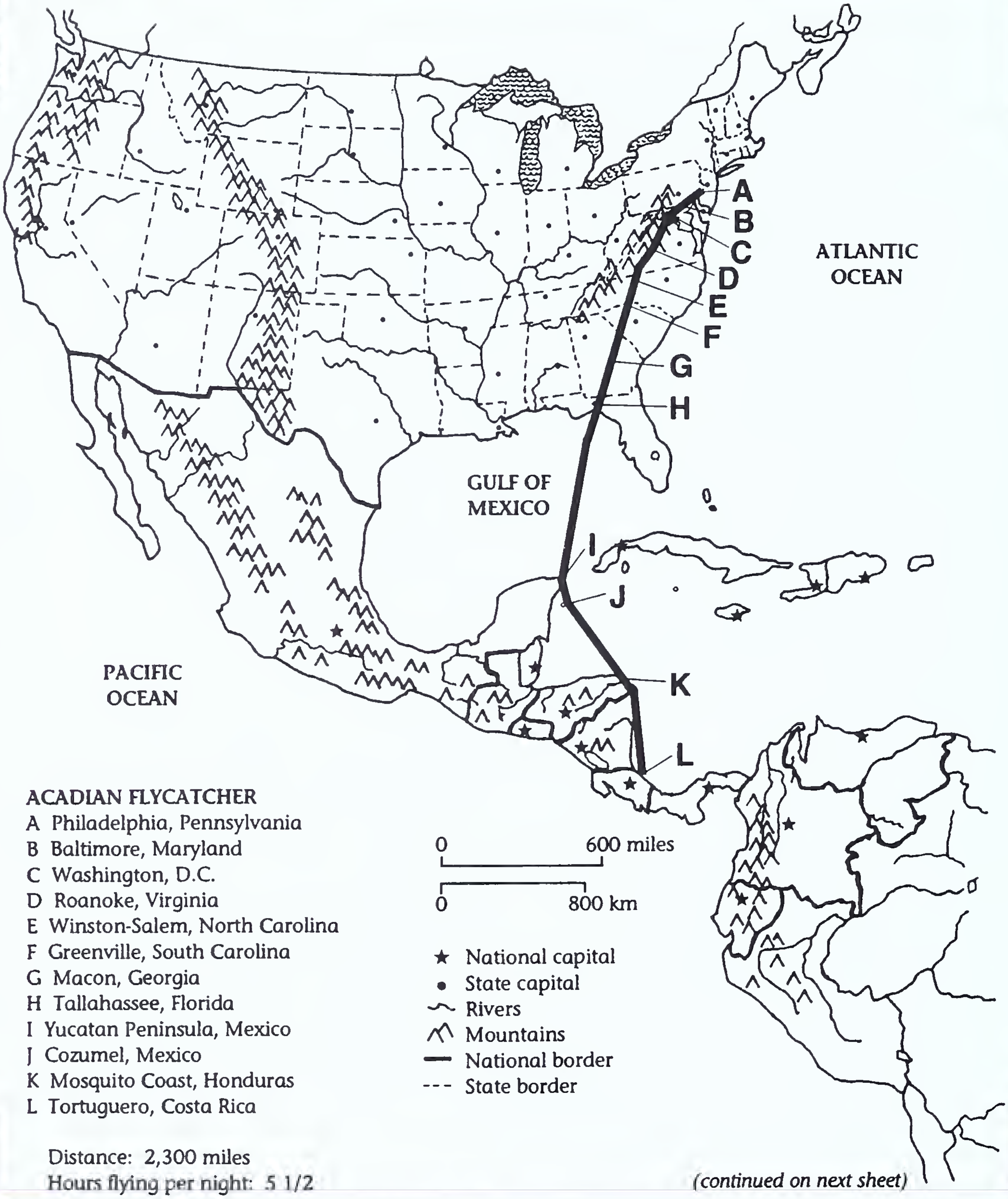
Distance: 3,000 miles
Hours flying per day: 7 1/4

*(continued on back)*

© 1994 New Jersey Conservation Foundation, Songbird Connection

# Geography Is for the Birds

## MAP ANSWER GUIDE (continued from front)



**ACADIAN FLYCATCHER**

A Philadelphia, Pennsylvania
B Baltimore, Maryland
C Washington, D.C.
D Roanoke, Virginia
E Winston-Salem, North Carolina
F Greenville, South Carolina
G Macon, Georgia
H Tallahassee, Florida
I Yucatan Peninsula, Mexico
J Cozumel, Mexico
K Mosquito Coast, Honduras
L Tortuguero, Costa Rica

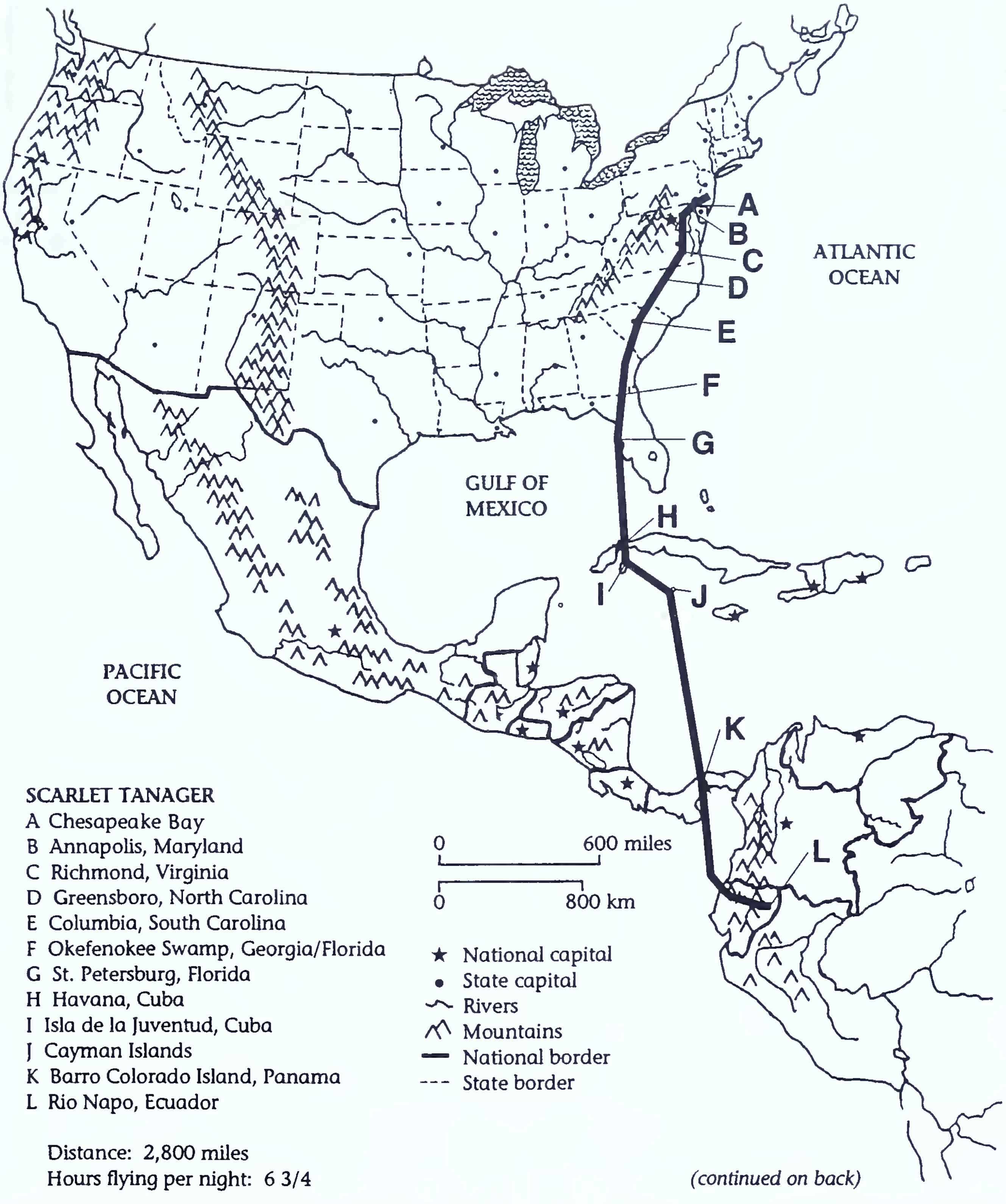
Distance: 2,300 miles
Hours flying per night: 5 1/2

*(continued on next sheet)*

© 1994 New Jersey Conservation Foundation, Songbird Connection

# Geography Is for the Birds

MAP ANSWER GUIDE (continued from previous sheet)



**SCARLET TANAGER**
A Chesapeake Bay
B Annapolis, Maryland
C Richmond, Virginia
D Greensboro, North Carolina
E Columbia, South Carolina
F Okefenokee Swamp, Georgia/Florida
G St. Petersburg, Florida
H Havana, Cuba
I Isla de la Juventud, Cuba
J Cayman Islands
K Barro Colorado Island, Panama
L Rio Napo, Ecuador

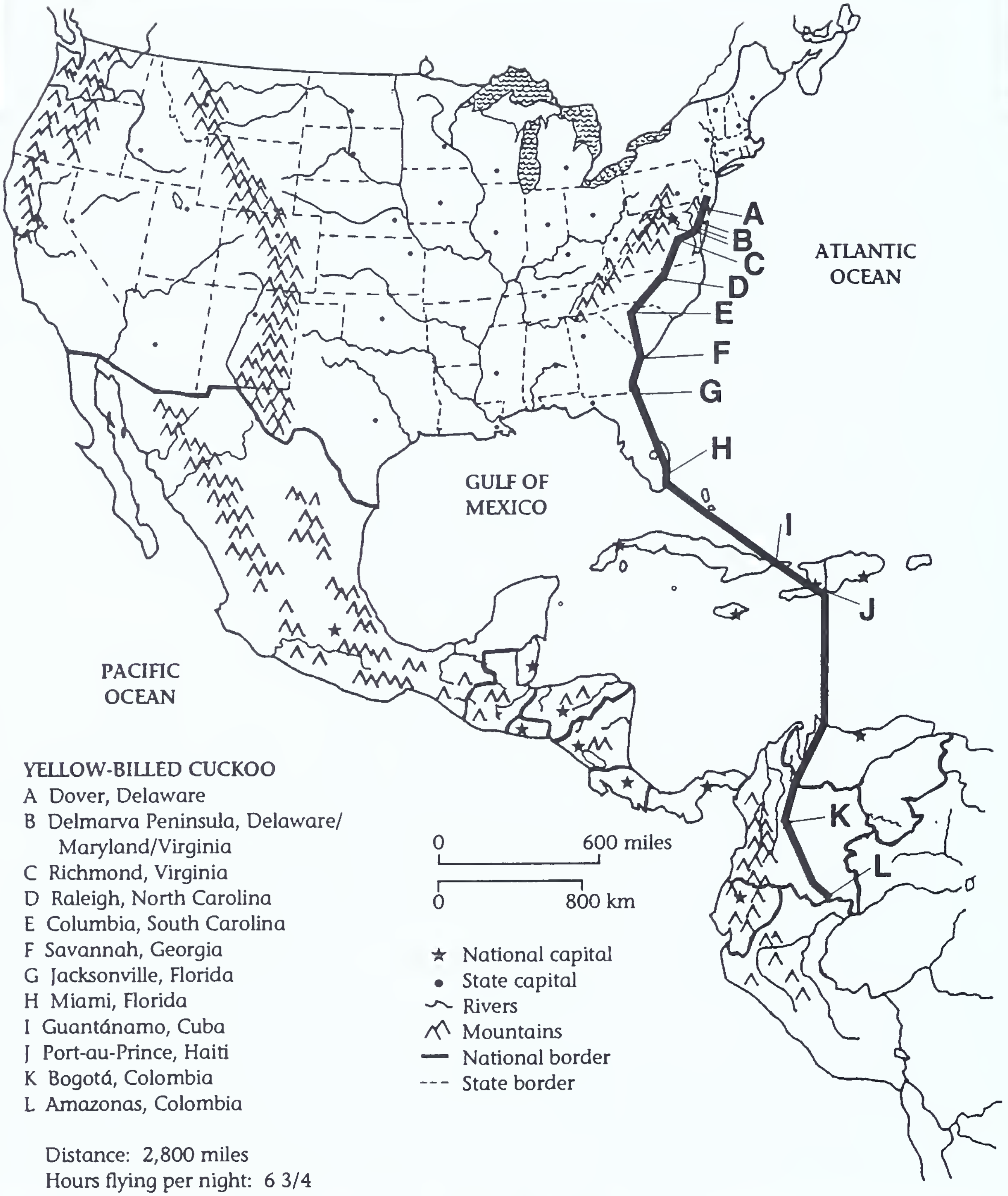
Distance: 2,800 miles
Hours flying per night: 6 3/4

*(continued on back)*

© 1994 New Jersey Conservation Foundation, Songbird Connection

# Geography Is for the Birds

MAP ANSWER GUIDE (continued from front)



### YELLOW-BILLED CUCKOO

A Dover, Delaware
B Delmarva Peninsula, Delaware/
Maryland/Virginia
C Richmond, Virginia
D Raleigh, North Carolina
E Columbia, South Carolina
F Savannah, Georgia
G Jacksonville, Florida
H Miami, Florida
I Guantánamo, Cuba
J Port-au-Prince, Haiti
K Bogotá, Colombia
L Amazonas, Colombia

Distance: 2,800 miles
Hours flying per night: 6 3/4

© 1994 New Jersey Conservation Foundation, Songbird Connection

# Lesson 2

# *An Eventful Journey*

## OBJECTIVES:

Students will recognize that migration is a regular seasonal movement; understand that Pennsylvania is in the Atlantic Flyway and that birds use its habitat as resting and feeding areas; and demonstrate that birds encounter obstacles created by natural phenomena and human interference.

## METHOD:

By participating in an active simulation, participants become migrating birds, and encounter obstacles of migration.

## MATERIALS:

*24 Migration Statements* (provided), ten *Risk Statements* (provided), 34 3 x 5 index cards, gummed labels, magic marker, glue or stapler, 24 clip-on clothespins (optional).

## BACKGROUND:

Bird migration refers to the regular seasonal movement of certain species of birds. Nearly all North American birds migrate between their breeding areas and their wintering areas. Each species has its own special requirements for food and time for breeding; hence, each migrates at different times. The major catalyst for bird migration is the seasonal change in the amount of daylight. In spring, lengthening days trigger hormonal changes in birds that prompt northward migration. In autumn, decreasing daylight effects similar changes that prompt southward migration. The benefits of migration include increased access to food and nesting territories, as well as escape from extreme climate.

During migration, birds encounter many obstacles. They need to rest and feed during flights north and south. Severe weather, lack of food, destruction of prime habitat through alteration or pollutants, and human harassment are all problems that may result in diminished survival rates among migrants. As a result of these obstacles, it is estimated that many species have a 50% mortality rate. In young birds it may be as high as 80%.

**Age:** Grades 4-6

**Subjects:** Science, physical education

**Skills:** Inferring, predicting, interpreting data, formulating hypotheses

**Duration:** 40 minutes

**Group size:** 12 or more

**Setting:** Indoors (with ample space) or outdoors

**Key vocabulary:** Ornithologist, habitat, physiological

Ornithologists study migration in several ways. One way is through simple observation: count the number of birds that fly through a specific area during a specific time period. Hawk Mountain Sanctuary in Kempton, Pennsylvania, conducts a regular autumn hawk count. Ornithologists also study migration by banding birds. Bird banding involves catching birds alive and placing small, individually numbered aluminum bands on their legs. When banded birds are recaptured or found dead elsewhere and the numbers on the bands are reported (see Chapter 5 for more information on bird-banding), scientists gain facts about where the birds have been, how long they live, and the physiological changes caused by their migrations. Scientists use the information they collect from counting birds to detect upward and downward trends in bird populations. A declining trend will sometimes warn that there may be a problem in the environment.

There are four major flyways in the United States (general routes that birds follow): Atlantic, Central, Mississippi, and Pacific. Pennsylvania is in the Atlantic Flyway.

## PRE-PLANNING:

1. Prepare a set of journey cards by copying the *Migration Statements* provided. Cut and attach each to an index card.
2. Number the back of each index card with the corresponding statement number. Clip one clothespin to each card to prevent the cards from blowing away (optional). These cards will be used to form a simulated migration path. (Consider laminating cards to reduce wear and tear.)
3. Prepare a set of risk cards by copying the *Risk Statements* provided. Cut and attach to index cards. Mark the back of each card with "RISK." Clip cards together with a clothespin.
4. Find an appropriate location for the game (indoors or outdoors). You will need approximately 100 feet of clear pathway (to be delineated with journey cards, see Procedure) for the students to follow, with separate starting and ending points. The pathway does not have to be linear.
5. Mark several gummed labels with an "x." Place them at the end of the pathway. (There are three mortality cards. The students who come to the finish line with these cards get a label stuck to their forehead.)
6. Wait until the game is about to begin before placing the cards on the pathway.

Many songbirds migrate at 500 - 2000 meters. At these altitudes, special adaptations in their blood- increased levels of red blood cells and two forms of hemoglobin — allow them to maintain needed oxygen levels.

## MOTIVATIONAL ACTIVITY:

Engage the students in a discussion about plans for a journey.

- "You are going on a trip to Florida. What are some things that would help you get there?" *(Fair weather, car in good condition, fuel, airplane, money for fares, food, suitcases, place to rest along the way.)*
- "What are some things that would upset your plans along the way?"

*(Flat tire, breakdown, accident, no places to eat or sleep on the way, lost or stolen money, plane crash.)*

## PROCEDURE:

1. Explain to the students that they are going to pretend to be migrating birds.
2. Create a migration path with the journey cards by placing each card face down at four-foot intervals along the pathway that you previously chose.
3. Risk cards should be set in a pile off to the side of the pathway.
4. The ideal number for this game is 12. When the class size is larger, students can travel in twos or threes and "fly" as a single unit within their group to each space.
5. Divide the class into three groups. Designate early, middle, and late migrants (as specified at end of lesson), giving each student or group the name of a migratory bird.
6. Beginning with the first group of migrants, assign each student/unit a number from 1 to 4.
7. Start the game by sending the first group (early migrants) onto the pathway: first student/unit to card #1, second to card #2, etc.
8. Instruct the students to pick up a card, read it, replace it face down and do what the card tells them to do. Anytime someone else is using the card to which they have been sent, they are to go to the risk pile and follow the instructions on the card they select. If a number along the migration path is missing or out of sequence, go to the next card in the path.
9. As the journey cards become vacant, new migrants enter the pathway. Then repeat the procedure with the middle and late migrants.
10. When all have reached the finish line, assemble for discussion.

## EXTENSION:

- On an atlas or map, locate all the sites mentioned on the journey cards.
- Use props along the journey route that symbolize what is depicted on the journey cards, e.g., oil can for oil spill, umbrella for a bad storm, etc.

## EVALUATION:

- Let's talk about your journey. What obstacles did you encounter as birds? Which of those obstacles were created by people? *(Power lines, plastic fishing line, pollution, glass buildings.)* Which were natural phenomena? *(Hawks, cold snaps, difficult winds, storms.)*
- What things helped you complete your migration? Which of these were created by people? *(Bird feeders, wildlife refuges.)* Which were natural phenomena? *(Good winds, plenty of food.)*
- Why didn't all of you finish at the same time? *(Birds migrate at different*

*times, birds were held back by obstacles, and were advanced by beneficial activities.*

- What do you think happened to the 'birds' with the 'x's' on their foreheads? *(They died.)*
- What kinds of habitats would birds use as they migrate through Pennsylvania? *(Marshes, mountain ridges, fields, coastal areas, lakes, ponds, streams, rivers, swamps, woodlands.)*
- What should people consider when altering a natural habitat by building and development? *(Current use of the area by wildlife and migrating birds, what impact the development would have, and whether development would displace animals permanently.)*

## RECOMMENDED LITERATURE:

Ford, Paula. *Birders Guide to Pennsylvania.* Houston: Gulf Publishing Company, 1995.

Gans, Roma. *How Do Birds Find Their Way? A Let's Read and Find Out Science.* New York: Harper Collins Publishers, 1996.

Miller, Debbie. *Flight of the Golden Plover: The Amazing Migration Between Hawaii and Alaska.* Anchorage: Alaska Northwest Books, 1996.

*On the Net: Journey North, An Interactive Global Study of Wildlife Migration and Seasonal Migration.* (see Appendix) Track various wildlife migrations, including songbirds.

Adapted with permission from:
Kane, Patricia F., Rosselet, Dale A., and Anderson, Karl
*Bridges to the Natural World,* New Jersey Audubon Society, 1992.

# Pennsylvania Birds Migration Chart

The following is a partial list of birds that migrate to or through Pennsylvania.

## EARLY MIGRANTS

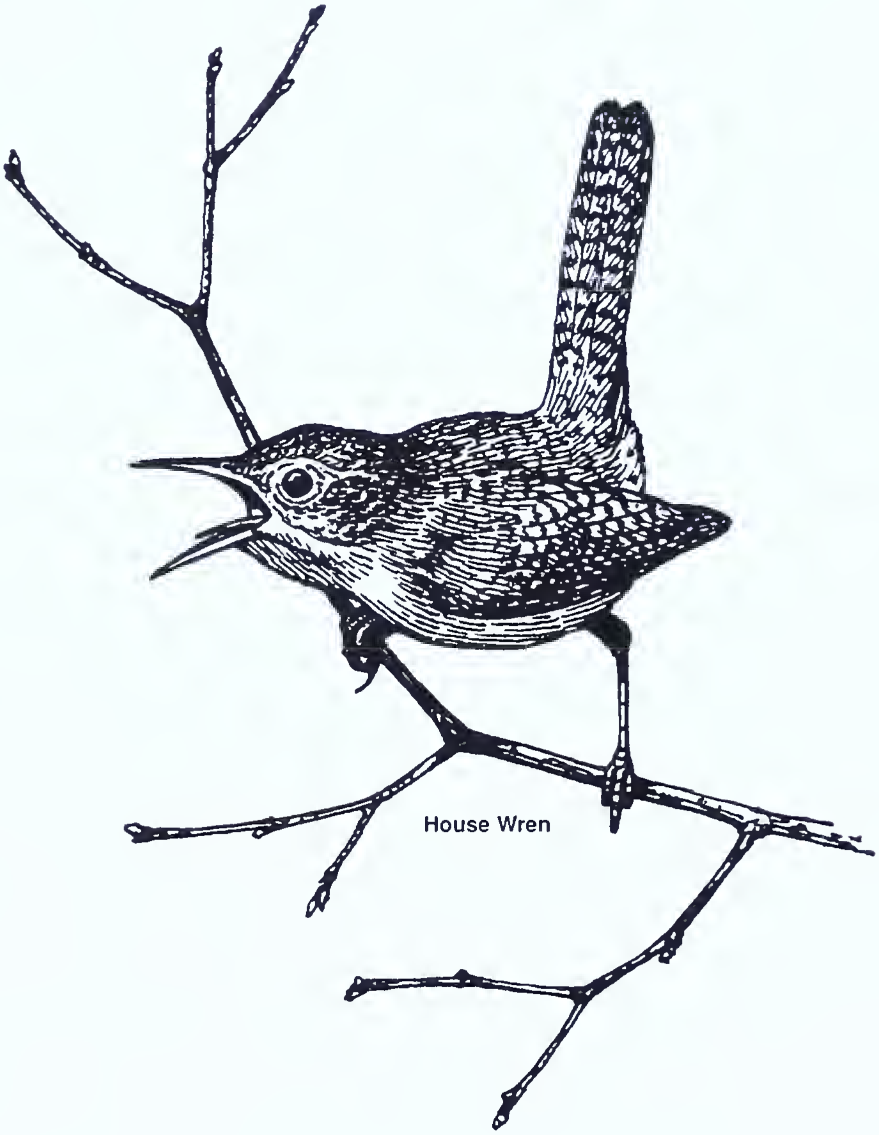
Late February through mid-April
Common grackle
Turkey vulture
Red-winged blackbird
Eastern bluebird
Yellow-shafted flicker
Red-tailed hawk
Saw-whet owl
Ring-necked duck
Pine warbler
Ruddy duck
American robin
Killdeer
Eastern phoebe

## MIDDLE MIGRANTS

Mid-April through mid-May
Field sparrow
Ruby-crowned kinglet
Solitary sandpiper
Least tern
Whip-poor-will
Eastern kingbird
House wren
Veery
Blue-winged warbler
Yellow warbler
Ovenbird
Northern oriole
Scarlet tanager
Rose-breasted grosbeak

## LATE MIGRANTS

Mid-May through mid-June
Willow flycatcher
Mourning warbler
Blackpoll warbler
Bay-breasted warbler



House Wren

## MIGRATION STATEMENTS

**(Cut out and attach to index cards)**

1.

WATCH OUT!!! Power lines ahead in Meadville. Don't hit them! Crawl ahead 4 spaces on your hands and knees.

2.

Many berries and insects are available in this overgrown field in the Erie National Wildlife Refuge. Smack your lips 10 times and move ahead 4 spaces.

3.

You land in a polluted marsh near the Clarion River and become sick from the food you eat. Sit down, hold your stomach for a count of 30, groan 10 times, then move ahead 2 spaces.

4.

Watch out for the sharp-shinned hawk! It wants to eat you. Freeze, count to 40, then move ahead 3 spaces.

13.

It's hard to find caterpillars to eat because the Michaux State Forest was sprayed with an insecticide. Open and close your eyes 25 times while you look for food. Move ahead 4 spaces.

14.

You just flew into a tall glass building in Philadelphia. Sit down, hold your head, count to 35, and move ahead 1 space.

15.

Strong winds from the wrong direction keep you from migrating. Go back 3 spaces.

16.

You become covered with oil from a spill in the Chesapeake Bay. Although rescued, you do not recover. The game is OVER for you. You died! DON'T TELL ANYONE. Take this card with you. Go to the finish line and place a gummed sticker on your forehead. Sit down and wait for the others to finish.

5.

You escape being captured by a cat in Emporium but slightly sprain your wing in the escape. Slowly swing your left arm around 10 times and move ahead 1 space.

6.

A bird bander in Coudersport catches you for research. After putting a numbered metal band on your leg, you are set free. Move ahead 3 spaces.

7.

You become entangled in a plastic fishing line near the Susquehanna River. You can't eat and are weak from hunger. A kind person takes you to the visitor center at Shikellamy State Park where the ranger cuts away the line. Hop on 1 leg in a circle, count to 40, then move ahead 4 spaces.

8.

You find a bird feeder in a 6th grader's backyard in Sunbury. Spend a few days enjoying the free food. Chew 20 times and move ahead 5 spaces.

17.

A good wind helps you fly. Move ahead 2 spaces.

18.

Strong winds along the Delaware River helps you to fly. Move ahead 4 spaces.

19.

You have been shot with a BB gun. The game is OVER for you. You're dead! DON'T TELL ANYONE. Take this card with you. Go to the finish and place a gummed sticker on your forehead. Sit down and wait for the others to finish.

20.

OOPS! An unexpected freeze kills off all insects that you usually eat. Move ahead 1 space as you try to find more food.

9.

It's raining, it's pouring, and you don't want to fly in this rainstorm. Count to 50 while you wait for the storm to stop, then move ahead 4 spaces.

10.

You can't find the spot you came to last year because a new shopping mall has been built on the site. Walk around in 3 wide circles searching for a place to rest and feed. You are still hungry; you have only enough strength to move ahead 1 space.

11.

You arrive at the Middle Creek Wildlife Management Area where there are lots of grain and insects to feed upon. Yum! Rub your stomach 15 times and move ahead 3 spaces.

12.

While traveling at night, you become confused by lights from the Reading Airport. You are tired from flying in circles and can't continue. Sit down, count to 40 and move ahead 4 spaces.

21.

Spend 5 days resting and feeding on the mudflats in John Heinz Wildlife Refuge. OOPS! An unexpected freeze kills off all insects that you usually eat. Go back 2 spaces as you try to find more food.

22.

A hurricane blows you from Florida into the Gulf of Mexico. You rest on the water, but get eaten by a gull. You are DEAD! Don't tell anyone. Take this card with you. Go to the finish line and place a gummed sticker on your forehead. Wait for the others to finish.

23.

You are unable to fly safely across the Gulf of Mexico to Cuba, because strong winds blow you off course. Go back 6 spaces.

24.

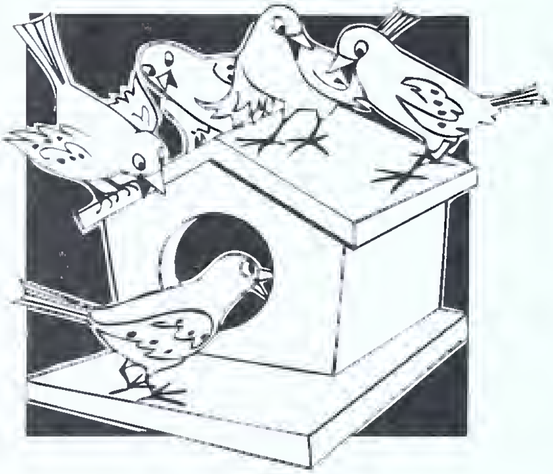
Congratulations! You have successfully flown across the Gulf of Mexico to your wintering grounds in Ecuador. Fly to the finish line!

## RISK STATEMENTS

(Cut out and attach to index cards)

| | |
|---|---|
| Go to Card No. 9 | Go to Card No. 23 |
| Go to Card No. 18 | Go to Card No. 3 |
| Go to Card No. 24 | Go to Card No. 6 |
| Go to Card No. 5 | Go to Card No. 15 |
| Go to Card No. 10 | Go to Card No. 17 |

# Lesson 3
# *Avian Olympics*



**Age:** Grades 4-8

**Subjects:** Science, math, physical education

**Skills:** Gather, organize, analyze and interpret data

**Duration:** 1-2 class periods

**Group size:** Any size

**Setting:** Indoors or outdoors

**Key vocabulary:** Migration, fat loading

## OBJECTIVES:

Students will describe some remarkable feats that migrating birds perform; and suggest reasons that individual birds may not survive a difficult migration.

## METHOD:

By competing in physical activities, students learn about birds' physical abilities and difficulties of migration.

## MATERIALS:

Copies of *Student Worksheets* (provided), *Teacher Answer Key* (provided), large index cards, stop-watch, triple-beam balance, clock with a second hand, world map with scale in kilometers.

## BACKGROUND:

Birds are amazing animals. Although most birds can fly, those that migrate between breeding grounds in temperate regions and wintering grounds in the tropics are capable of truly remarkable feats on the wing. While some bird species stop and feed during migration, many build up huge fat reserves in preparation for migration and make the trip without stopping. To fully appreciate what these migrants accomplish, consider the amount of energy reserves a bird must build up (fat-loading) in preparation for migration, the distance a bird must travel, and how fast it must fly.

In general, neotropical migratory birds spend up to a third of each year migrating from wintering grounds to breeding grounds and back again. Many embark on a 20-hour-plus nonstop flight over as much as 1,000 kilometers (660 miles) of the Gulf of Mexico to reach the Yucatan Peninsula. Unless confronted by storms or severe cold fronts, migrants make the trip relatively easily. Others take the more circuitous overland route around the Gulf through Texas into Mexico. While this route may be up to three times longer, birds can stop to rest and feed along the way.

Many natural and human-made obstacles may cause problems for birds during migration. Hazardous storms and strong winds can blow birds off course or present headwinds that slow progress.

Loss of stop-over habitat due to land conversion and deforestation can prohibit birds from getting needed food and rest along the route. Collisions with human constructions such as tall television towers are responsible for many bird deaths.

## PROCEDURE:

1. Review the *Teacher Answer Key* and set up the equipment.
2. Divide the class into cooperative groups (4 to 6 students) to compete against each other in problem-solving, math skills, speed and endurance. Each team should select a mascot migratory group of birds, such as: warblers, hummingbirds, swifts, swallows, sparrows, thrushes and orioles. The object is to get the most possible points. Hand out a copy of the *Student Worksheet* to each group. Review each activity with the group.
3. Designate someone from each group to be the spokesperson, a recorder and someone to keep the group on task. All must participate.
4. After the teams have completed the eight Olympic activities on the *Student Worksheet,* provide a reward for all participants. If there is not enough equipment for all the groups, set up each procedure as an activity station and have groups rotate.
5. Discuss these amazing feats that can be performed by birds, but not by humans. Discuss how migration can sometimes be difficult for birds despite their abilities. Discuss the impacts of deforestation along the migratory route on some of these birds? What natural obstacles or disasters can make migration even more difficult for birds? What man-made obstacles must migrating birds face? What are the benefits of migration, despite these hazards?

## MODIFICATION:

- Set each competition up at separate site-like centers around the playing field or gymnasium. Have the groups each select a member to participate in each center simultaneously.

## EXTENSION:

- Conduct a migration obstacle course. Even with all their physical abilities, birds have many obstacles to overcome during migration. Let your students design and develop a migration obstacle course that represents these various obstacles. For mountains, climb the bleachers; to represent a long distance, flap arms and run a lap around the school; dodge a chair in the path to simulate avoiding television towers; jump over a pan of water representing the Gulf of Mexico; to simulate lack of water along the route, eat a cracker and whistle before starting; sort through a container of assorted dried beans to find five green peas to represent the need to find food; to avoid being eaten by a cat, climb a tree, flag pole, jungle gym, or a flight of stairs. Make this a relay event so everyone can participate. The fastest group gets a point.

- Ask officials from your local television towers, tall buildings, lighthouses and other tall aerial obstructions if they have any data concerning the number of birds killed there during migrations. If they don't, see if they will let you make regular collections or observations of dead birds there during the spring or fall migration. (NOTE: You must have a permit to collect or possess a dead bird, songbird feathers, bird nests, or bird eggs. Contact the Pennsylvania Game Commission for permit information.) How many birds are killed by these obstructions in your area? Although various solutions have been tried, this problem still persists. No one knows how to prevent birds from crashing into tall aerial obstructions. Working to solve this problem could be an action project.

## EVALUATION:

- Evaluate students' math calculations.
- Evaluate students' effectiveness in cooperative groups.
- Ask students to write a fictitious account of a bird's difficult migration.

## RECOMMENDED LITERATURE:

Gans, Roma. *Birds Eat and Eat and Eat.* New York: Thomas Crowell, 1963.

Adapted with permission from:
Gilchrist, Susan; Row, Kadi and Borneman, David. *One Bird—Two Habitats.* Wisconsin Department of Natural Resources, 1993.

# AVIAN OLYMPICS
# STUDENT WORK SHEET

1. Choose a mascot migratory bird for your group name; record it here:

2. The average middle school student's weight is 100 pounds, or 45 kilograms. How many grams are in 45 kilograms?

   Compare that weight to the weight of the ruby-throated hummingbird, which weighs a mere 4 grams (0.14 ounces). Try to find an object that weighs 4 grams. How many hummingbirds (at 4 grams each) would it take to equal the average middle school student's weight (at 45 kg)?

3. What's the largest number of quarter-pound hamburgers any student in the group has ever eaten in a single meal?

   What percentage of the average middle school student's weight is this? (assuming a quarter-pound hamburger weighs 114 grams) (Hint: Use figures from Question 2 to help find the answer.)

   Compare this with the blackpoll warbler, which increases its body weight by 50% in preparation for its long migration. If the average student weighing 45 kg were going to increase his/her body weight by 50%, how much weight would s/he gain? And how many quarter-pound hamburgers would this weight gain represent?

4. How long did it take the fastest student in the group to sprint 50 meters? Calculate how long it would take this runner to cover 1 kilometer.

   Using a map of the world, estimate the distance in kilometers from school to Nicaragua. How long would it take the fastest student to sprint directly to Nicaragua, assuming s/he could run in a straight line without stopping?

Compare these results with the blackpoll warbler, which is able to migrate 4000 kilometers (2,480 miles) in 15 days, or sanderlings, which are able to migrate 7,500 kilometers (4,650 miles) in 230 hours or about 10 days.

5. How many arm flaps can your group's representative do in 10 seconds?

Compare this with the ruby-throated hummingbird, which can flap its wings 120 times per second. Most songbirds flap their wings about 12 to 16 times per second. Using the time from the Fast Travel Event, calculate how many arm flaps a student would make in a "flight" to Nicaragua.

6. Which group member can continue flapping his/her arms the longest? How long?

Which group member can run the farthest without stopping? How far is that?

How does this compare with the ruby-throated hummingbird, which flies nonstop for 1000 kilometers as it migrates across the Gulf of Mexico, or the snow goose, which can travel 2,750 kilometers (1,700 miles) in 2 1/2 days without stopping?

7. Which group member has lived the farthest away from his/her current home? How many kilometers away is that?

How does this compare with the Arctic tern that travels over 19,000 kilometers (12,000 miles) twice a year from the high-arctic regions of Canada and Greenland to the Antarctic Ocean? Many small songbirds may undertake migrations of 9,700 to 11,300 kilometers (6,000 to 7,000 miles). How many kilometers is it from Nicaragua to Pennsylvania?

8. Humans burn about 60 calories by running one kilometer. At this rate, how many calories would you need to run from here to Nicaragua?

If one gram of fat yields nine calories of heat, how many kilograms of fat would you need to eat before making the trip?

How does this compare with the ruby-throated hummingbird, which gorges itself on less than one gram of fat-rich insects, then makes an 1000 kilometer (600 mile) non-stop flight across the Gulf of Mexico? Think about how few calories this bird burns per kilometer of flight, or the golden plover, which travels 3,900 kilometers (2,400 miles) in 48 hours of continuous flight while using less than 60 grams (2.1 ounces) of body fat.

# AVIAN OLYMPICS
# TEACHER PROCEDURES AND ANSWER KEY

(Note: It is approximately, 2,036 airline miles to Nicaragua, or 3,284 kilometers.)

1. Divide the class into cooperative groups (4 to 6 students) to compete against each other in problem-solving, math skills, speed and endurance. Hand out a copy of the Student Worksheet to each group. Each team should select a mascot migratory group of birds, such as: warblers, hummingbirds, swifts, swallows, sparrows, thrushes, orioles, and goatsuckers. The object is to get the most possible points.

*STUDENTS: Choose a mascot migratory bird for your group name.*

2. **Weigh-in:** The average middle school student's weight is 100 pounds or 45 kilograms. Ask students: How many grams are in 45 kg? (45,000g).

*STUDENTS: The average middle school student's weight is 100 lbs. or 45 kg. How many grams are in 45 kg?*

45 kg x 1,000g/kg = 45,000g

Compare that weight to the weight of the ruby-throated hummingbird, which weighs a mere 4 grams (0.14 ounces). Each team should try to find an object that weighs 4 grams. (A large index card weighs close to 4 grams.) Test their entries with a triple-beam balance scale. If no team is close, give them all another chance to see how close they can get with different objects. Working together, each team should calculate how many hummingbirds (at 4 grams) it would take to equal the average middle school student's weight (at 45 kg). Groups with the correct answer receive one point.

*STUDENTS: Try to find an object that weighs 4 grams. How many hummingbirds (at 4 grams each) would it take to equal the average middle school student's weight (at 45 kg)?*

45,000g ÷ 4g = 11,250 hummingbirds

3. **Eating like a bird (Fat-loading):** Each group should select a spokesperson for this math contest. Other group members may help find the answers. One quarter-pound hamburger with fries is a fairly normal meal for a student of this size. Two or three burgers would be a huge meal. What's the largest number of quarter-pound hamburgers any of the students has ever eaten in a single meal? What percentage of the average middle school student's weight is this? (assuming a quarter-pound hamburger weighs 114 grams). Groups with the correct answer get one point.

*STUDENTS: What's the largest number of quarter-pound hamburgers any student in the group has ever eaten in a single meal?*

*What percentage of the average middle school student's weight is this? (assuming a quarter-pound hamburger weighs 114 grams).*

If 3 is the number of quarter-pounders:
3 burgers x 114g (burger weight) = 342g
342g ÷ 45,000g (student weight) = 0. 76 %, or less than 1%

Compare this with the blackpoll warbler which increases its body weight by 50% in preparation for its long migration. If an average student weighing 45 kg were going to increase his/her body weight by 50%, how much weight would s/he gain? The first group with the correct answer gets one point. How many quarter-pound hamburgers would this weight gain represent?

*STUDENTS: Compare this with the blackpoll warbler, which increases its body weight by 50% in preparation for its long migration. If the average student weighing 45 kg were going to increase his/her body weight by 50%, how much weight would she/he gain? And how many quarter-pound hamburgers would this represent?*

45kg (student weight) x .50 = 22.5kg or 22,500g
22,500g ÷ 114g (burger weight) = 197 burgers

4. **Fast-travel:** With each team entering its fastest runner, have a 50-meter dash to determine how long it takes a student to sprint 50 meters (approximately 55 yards). The group with the fastest sprinter gets a point. Calculate how long it would take this runner to cover 1 kilometer.

*STUDENTS: How long did it take the fastest student in the group to sprint 50 meters? Calculate how long it would take this runner to cover 1 kilometer.*

If, for example, a student runs 50 meters in 15 seconds:

$$\frac{15 \text{ seconds}}{50 \text{ meters}} \quad x \quad \frac{x}{1{,}000 \text{ meters}}$$

$$15{,}000 = 50\,x$$

$$\frac{15{,}000}{50} = \frac{300 \text{ seconds}}{1{,}000 \text{ meters}}$$

$$\frac{300 \text{ seconds}}{60} = 5 \text{ minutes}$$

Then, using a map of the world, have students estimate the distance in kilometers from their school to Nicaragua. Using the two measurements, have students calculate how long it would take the fastest student to sprint directly to Nicaragua, assuming s/he could run in a straight line without stopping. Give a point to each team with the correct answer.

*STUDENTS: Using a map of the world, estimate the distance in kilometers from school to Nicaragua. How long would it take the fastest student to sprint directly to Nicaragua, assuming she/he could run in a straight line without stopping?*

60 minutes ÷ 5 min/km = 12 km/hour
4000 km ÷ 12 km/hour = 333 hours, or
333 hours ÷ 24 hours/day = 13.9 days

Compare these results with the blackpoll warbler, which is able to migrate 4,000 kilometers (2,480 miles) in 15 days, or sanderlings, which are able to migrate 7,500 kilometers (4,650 miles) in 230 hours, or about 10 days.

5. **Wing-flapping:** Using a clock with a second hand and one representative from each team, determine the highest number of arm flaps possible in 10 seconds. Give a point to the group whose representative flapped the most.

*STUDENTS: How many flaps can your group's representative do in 10 seconds?*

Compare this with the ruby-throated hummingbird, which can flap its wings 120 times per second. Most songbirds flap their wings about 12 to 16 times per second. Using the time from the Fast-travel event, calculate how many arm flaps a student would make in a "flight" to Nicaragua.

6. **Non-stop travel:** Which student can continue flapping his/her arms the longest? Give that student's team a point.

*STUDENTS: Which group member can continue flapping his/her arms the longest? How long?*

How does this feat compare with the golden plover, which flies non-stop for 48 hours as it migrates from Nova Scotia to South America?

Which student can run the farthest without stopping?

*STUDENTS: Which group member can run the farthest without stopping? How far is that?*

How does this compare with the ruby-throated hummingbird, which flies non-stop for 800 kilometers as it migrates across the Gulf of Mexico, or the snow goose, which can travel 2,750 kilometers (1,700 miles) in 2 1/2 days without stopping?

7. **Long-distance travel:** Have each team identify which of its members has lived farthest from their current home. Figure out how many kilometers away that is on a map. The group with a representative from the farthest away gets a point

*STUDENTS: Which group member has lived the farthest away from their current home? How many kilometers away is that?*

How does this compare with the Arctic tern that travels over 19,000 kilometers (12,000 miles) twice a year from the high-arctic regions of Canada and Greenland to the Antarctic Ocean? Many small songbirds may undertake migrations of 9,700 to 11,300 kilometers (6,000 to 7,000 miles). How many kilometers is it from Nicaragua to Pennsylvania?

*STUDENTS: How many kilometers is it from Nicaragua to Pennsylvania?*

Approximately 2,036 airline miles (3,284 kilometers)

8. **Fuel-efficiency:** Humans burn about 60 calories by running one kilometer. At this rate, how many calories would a student need to run from here to Nicaragua?

*STUDENTS: Humans burn about 60 calories by running one kilometer. At this rate, how many calories would you need to run from here to Nicaragua?*

60 calories x 4,000 km = 240,000 calories

If one gram of fat yields nine calories of heat, how many kilograms of fat would this student need to eat before making the trip? Give a point to the team that can calculate this first.

*STUDENTS: If one gram of fat yields nine calories of heat, how many kilograms of fat would you need to eat before, making the trip?*

240,000 calories ÷ 9 calories/g equals 26,666g
26,666g ÷ 1,000 equals 26.66kg

How does this compare with the ruby-throated hummingbird, which gorges itself on less than one gram of fat-rich insects, then makes an 1000 kilometer (600 mile) non-stop flight across the Gulf of Mexico. Think about how few calories this bird burns per kilometer of flight, or the golden plover, which travels 3,900 kilometers (2,400 miles) in 48 hours of continuous flight using less than 60 grams (2.1 ounces) of body fat.

# Lesson 4

# *Habitat Squeeze*

**Age:** Grades 4-12

**Subjects:** Science, social studies

**Skills:** Analysis, application, discussion, inference, observation

**Duration:** 20 minutes

**Group size:** Any size

**Setting:** Indoors

**Key vocabulary:** Habitat, carrying capacity

## OBJECTIVES:

Students will define carrying capacity; and recognize that shrinking size and diminished quality of habitat adds stress to birds and other animal populations, including humans.

## METHOD:

Through a simulation, students experience habitat loss over time.

## MATERIALS:

Rope to stretch across the classroom; a sign reading "Off-Limits—Do Not Enter".

## BACKGROUND:

Carrying capacity is defined as the population that a given area, such as a forest, will support without either the area or the population undergoing deterioration. It is a dynamic equilibrium established between any life form and its environment. For example, a particular forest may be capable of providing habitat (nesting site, food resources, water and space) for 100 birds of one species. If the population is under 100, neither the birds nor the forest will suffer. If the population exceeds 100, the forest ecosystem will be strained, and each bird will be subject to stress with the possible death of some individuals.

Many factors can change an area by either increasing or decreasing the carrying capacity. Some factors are related to the size of habitat; others are related to the quality of the habitat. For example, an increase in understory shrubs may provide habitat for a particular bird species or group of birds. This increases the carrying capacity of the forest for that bird population, but does not increase the size of the forest. In another example, a bird species may be dependent upon a stream going through the forest for its water supply. If the stream flow is decreased or eliminated so that it no longer travels through the forest, that forest then has a decreased carrying capacity for that bird species.

Human habitat may be considered in terms of carrying capacity as well. A researcher may indicate that a particular region has a carrying capacity of 10,000 humans. However, people often modify their surroundings in order to increase the carrying capacity of an area, for example, importing food from outside the area.

Some think we have exceeded the earth's carrying capacity for human population, the result being disease, starvation, war, and environmental degradation. A population exceeding the area's carrying capacity may continue to exist; but both the area and some individuals will be stressed. In the long run, a population that exceeds its carrying capacity of an area is considered unsustainable.

Much of the reduction of interior migratory forest bird populations is the result of the loss of forest habitat for these birds, both here and in their wintering grounds. As suitable forest habitat is reduced, the carrying capacity of the land is reduced for those birds dependent on the forest interior. Birds that depend on fields or forest edges may experience an increase in carrying capacity, if forest cover is reduced but not built over.

All though total forest cover is increasing in the United States, the make up of these forests have dramatically changed. In Pennsylvania, we no longer have chestnut forests, having lost these to timbering and the chestnut blight.

A picture of forest cover across the United States at four periods in time shows the national changes in large tracts of forests (see Appendix). As the maps show, large tracts of forest cover declined nationally from the year 1620 to a low around 1920, but since then, they have been increasing. These maps include all tree coverage, small woodlots and savannahs, not just large tracts.

One present concern regarding loss of forest habitat for forest interior birds is the reduction of large tracts of forest. In addition, those areas deforested consist of land that for the most part is being or has been converted to other nonforest uses, such as urban development, subdivisions, and farms. These land conversions generally have a long term effect on the landscape and the habitat available for a variety of birds.

Aside from loss of habitat area, these conversions reduce the quality of habitat for birds that nest in forests. This decrease in habitat size and quality contributes to bird population declines by allowing predators access to songbird nests. For example, suburbanization opens up the forest to nest predators that are associated with human populations, such as raccoons, skunks, opossums, and house cats, plus avian nest predators such as crows, jays, grackles and the parasitizing cowbird. Even in the country, free-ranging cats are associated with human populations and are considered a threat to bird populations. One study indicates that 14 million birds are killed by rural free-ranging cats in Pennsylvania alone each year.

The scarlet tanager is an example of a species that requires interior forests for breeding. Seventeen percent of the breeding population of scarlet tanagers can be found in Pennsylvania.

While land conversion away from forests represents the loss of habitat for forest birds, it may simultaneously increase Pennylvania's carrying capacity for people and other nonforest wildlife species, including some birds. The question becomes, is there a balance that is sustainable for both bird and human populations?

## PROCEDURE:

1. Before students enter the classroom, stretch a rope across one small corner of the room and hang the "Off-Limits--Do Not Enter" sign on it. (Use an area that is not absolutely essential for the functioning of the class.) Any furniture that can be moved should be removed from this area and crowded into the rest of the room.
2. When students ask about the rope and the sign, explain that it's part of an experiment and you'll discuss it later in the week. Explain that until then the area behind the rope is indeed "off-limits" and no one is to enter it for any reason. The students will simply have to learn to function in a slightly smaller space than that to which they are accustomed. Continue your normal daily activities.
3. Before the students enter the class the next day, move the rope to slightly enlarge the restricted area. Remove any objects from the restricted area and crowd them into the rest of the room.
4. Continue this process for the next two days (or as long as you and your students can tolerate it), but at least long enough to cause everyone to feel cramped.
5. Ask students how they felt about the rope and the expanding restricted area. Ask why the rope was there. Discuss the effects of the rope. At what point did it interfere with student activities? How much more could the off-limits area have been expanded before it fully disrupted class function?
6. Introduce the term "carrying capacity." Ask how the rope affected the carrying capacity of the classroom. If their numbers exceed the carrying capacity of their habitat, how would birds be affected? How might habitat loss in one part of the world affect another part of the world? Make the point that solving these kinds of problems requires a global perspective.

## DISCUSSION:

- Did the size of the off-limits area on one side of the room affect students on the other side of the room? When? How? Where would students have gone then? What effect would moving out of the classroom have on other people and on the way the class functioned?
- Do birds that depend on one type of habitat always have the option of moving somewhere else?
- What will birds do if there is not enough nesting territory or food to sustain them? Humans may be pushing forest bird populations to the limits of sustainability by removing larger and larger sections of suitable habitat. What are people using the land for when forest is removed? Are these human actions increasing or improving habitat for other birds or wildlife species?
- Is there a carrying capacity for people in a classroom? In a city? In

Pennsylvania? In Nicaragua? In the world? How much loss of habitat is allowable? How much is too much?

## EXTENSION:

- Refer to activity, "Shrinking Habitat" (see Chapter 2, Lesson 6) as an extension of how land development affects all plants and animals in a particular habitat.
- Have students research how much change has occurred in forests in their community over the last 200 years. County conservation districts or local environmental organizations might be able to provide information about pre-European-settlement vegetation in the area. Topography maps and aerial photos made years apart will show changes in forest cover. Another source of interesting, firsthand information about how the land use of the area has changed over several generations can come from the elderly community. Have students visit nursing homes or senior centers and interview the residents to determine if they remember more or less forest intact when they were young. See if they have noticed any changes in the abundance of birds and other wildlife.
- Refer to Chapter 6 for additional information on birds and human interaction.
- Have students determine the carrying capacity of their town or neighborhood. What factors influenced their decision? Were they able to come to an agreement on the number? How do human population increases affect the carrying capacity for other species? How do humans expand their carrying capacity? Should humans limit their numbers and live within the natural carrying capacity?

## EVALUATION:

- Have students write a brief explanation for marking off part of the classroom with the "Keep Out" rope (i.e., why you did this).
- Have students discuss their reaction to the exercise.

## RECOMMENDED LITERATURE:

Peet, Bill. *Farewell to Shady Glade*. Boston: Houghton Mifflin Co., 1966.
Quinn, Daniel. *Ishmael*. New York: Bantum/Turner, 1992.

Adapted with permission from:
Gilchrist, Susan; Row, Kadi and Borneman, David. *One Bird—Two Habitats*, Wisconsin Department of Natural Resources, 1993.

# Lesson 5

# *Forest Fantasy*

## OBJECTIVE:

Students will describe a forest in North America and one in Central America.

## METHOD:

Through an imaginary field trip, students visualize a forest in Pennsylvania and a forest in Nicaragua.

**Age:** Grades 4-8

**Subjects:** Science, language arts, art

**Skills:** Written communication, analyzing and interpreting information

**Duration:** One class period

**Group size:** Any

**Setting:** Indoors

**Key vocabulary:** Forest, hardwood, tropical

## MATERIALS:

Fantasy texts (provided).

## BACKGROUND:

Pennsylvania has 17 million acres of forest. These acres represent 57% of Pennsylvania's land area. The majority of this forested land is in the northern part of the state, with less forest acreage in the southeastern and southwestern parts. Pennsylvania has more private forest landowners (500,000, or 70%) than any other state in the nation.

Pennsylvania's forested land is most commonly northern hardwood and Appalachian oak forests. Tree species that make up these forests are red maple, northern red oak, black cherry, sugar maple, other oaks, eastern hemlock, beech and ash.

Nicaragua, by comparison, has approximately 8.6 million acres of forest land, which comprises 27% of the land area in Nicaragua. These are tropical forests, both wet and dry, because they lie in the hot and humid zone between the Tropics of Cancer and Capricorn. Nicaragua contains the largest remaining tract of untouched lowland tropical forest in Central America. On the eastern coast of Nicaragua is a strip of swamp forest. Inland from the swamp forest, in the south, is lowland forest, and, in the north, pine forest is followed by lowland forest towards the center of the country. The middle and western portions of Nicaragua are mostly nonforested, with some lakes and deciduous forest. Again, on the western coast, there are some areas of swamp forest.

## PROCEDURE:

1. Have students get comfortable in chairs or on the floor. They may remove glasses or shoes to be more comfortable. Dim the lights and ask students to close their eyes.
2. Read the relaxation and Pennsylvania fantasy text. Read very slowly, with pauses for the imagination to create the experience.
3. Have students quietly review their experiences in their minds before opening their eyes or lighting the room. Ask volunteers to share the images they remember.
4. Read the Nicaragua fantasy text; review and discuss those images.
5. Compare the two forest fantasies. Discuss the similarities and differences between the two forests. Relate the fantasy to real-life experiences in the woods. Point out that much of Pennsylvania is forested. Refer to the forest cover maps in the Appendix and explain that Nicaragua has the largest remaining tract of untouched lowland tropical forest in Central America, but not all tropical forests are rainforests.

## EXTENSION:

- Create a simulated forest of papier mâché and other materials in the classroom.
- Conduct research to identify one kind of tree that is common near the school.
- If possible, take a hike in a nearby forest and discuss how the real forest compares to the fantasy.

## EVALUATION:

- Have students draw or paint a scene or write a story from the forest they visualized or create a shoebox diorama of a forest with wildlife.

## RECOMMENDED LITERATURE:

Pratt, Kristen Joy. *A Walk in the Forest*. Dawn Publications, 1992.

Adapted with permission from:
Gilchrist, Susan; Row, Kadi and Borneman, David. *One Bird—Two Habitats,* Wisconsin Department of Natural Resources, 1993.

## Fantasy Text: A Pennsylvania Hardwood Forest

Close your eyes. Listen to all the sounds you can hear around you. Listen to the sound of your own breathing. Hear the air come in, fill up your lungs, and pass back out. Slow your breathing just a little. As you breathe, feel all the tension going out of your head, neck, shoulders, and arms. Feel the relaxation spread along your backbone. Now breathe the tension out of your legs. Inside your mind say to yourself: "I am comfortable. I am relaxed." Now you are ready to go on a walk in the woods. Inside your mind, picture all the things I am describing.

It's a beautiful day. The sun is shining. Even the humid earth smells like spring.

Last winter's snow has finally melted and last fall's leaves are visible on the damp ground, ready for the earthworms and insects to break the leaves into bite-sized pieces and return their nutrients to the earth.

Melted snow has collected in tree cavities and hollow stumps, soon to provide good breeding grounds for this year's crop of mosquitoes. Yes, soon you'll be feeling those itchy bites and hearing them whine. But mosquitoes do serve as food for bats and birds. The raspberry bushes and some of the tree shoots have been nibbled on this winter. From the looks of the tear and tooth marks on the brush, the deer and rabbits have been busy in this area. They'll be soon nibbling on this year's new greens, like those fiddleheads, or ferns, slowly unfurling on the forest floor. Tracks in the mud show that deer, rabbits, and raccoons have walked here. Look behind and see your own, larger tracks.

You hear a rapping, tapping sound. Turn and catch sight of a bird with a red-crested head. A pileated woodpecker has hollowed out a large oval cavity in one tree. All the wood shavings are on the ground around the base of the tree trunk. There must have been some insect larvae inside the tree. You see signs of other woodpecker work in the area. The excavated holes are of different sizes; some are by themselves, others are all in a row. This work will make good nesting cavities for chickadees, nuthatches, wrens, and that larger cavity may be good for a screech owl or a squirrel.

Sunlight is streaming through the forest treetops. You see a lone bee. The forest floor is a misty sea of light green, covered with young, fresh shoots of spring herbs. Some have great white flowers, with broad flat petals. You wonder if that bee, or some other insect or bird, pollinates those flowers. A fallen log looks inviting. You sit and listen for a bit. A squirrel is climbing that tree trunk. Notice how much noise its claws make as it scratches along the tree trunk. Here comes another squirrel and the chase begins: off the limb and a somersault recovery.

You hear bird sounds. The chickadee has changed its call from its winter "de...de...deee" to its mating whistle and there's plenty of general chickadee chatter. You watch as a small flock picks over tree branches for insect eggs and larvae. You notice a soft "thump, thump, thump" begin to get faster and faster and louder and louder. A ruffed grouse has found a log like the one you are sitting on and is drumming. Its large, feathered wings make the thumping sound faster and louder. The grouse is proclaiming its territory. It's too early for summer migrants, like the ovenbird, indigo bunting and flycatchers, but that rustling sounds as if the robins may be flipping over leaves looking for insects.

Just as the migrants are coming home to their nesting areas, it's time for you to go home, too. Now return to this place, but keep your eyes closed and remain quiet. Think back over your fantasy walk through the Pennsylvania woods. When you are ready, open your eyes.

# Fantasy Text:
# A Nicaraguan Rainforest

Get comfortable again. Close your eyes. Notice your own breathing. Feel the air move through you as though you are hollow. Breathe all the tension out of your feet and legs. Feel the relaxation spread along your backbone. Relax your upper body. Relax your face. You are ready to take a trip to a far away place you may never have been. Inside your mind, picture the things I describe.

The air is still and thick with humidity. Slivers of light stream downward from the dense upper branches of trees, hundreds of feet above, fading by the time they reach the forest floor. The sunbeams illuminate occasional vines, mosses, and orchids that cover a giant tree trunk and branches.

The animals that call this place "home" have left signs of their passing. You notice a split-hoofed animal track etched in the damp forest floor: a tapir. Your own footprints now accompany the variety of other animal tracks.

Many sounds echo under the green canopy. Vibrant, neon-colored birds like parrots and black toucans with bright yellow beaks fly through the thick vegetation and perch at many different levels. A howler monkey's howling from the treetops drowns out the other sounds for a moment. A wild pig or peccary suckling its piglets in the understory adds to the variety of jungle sounds. Big cats like ocelots and jaguars live here too, but their secretive behavior keeps them out of sight and sound. A flash of blue catches your eye. A large blue morpho butterfly flutters by and then is gone. Insects are everywhere. Some are hard to see because they look just like leaves. You watch out for the reptiles and amphibians that make their home in the forest, too. Some of the snakes and frogs are poisonous. A species of poison dart frog, red with blue feet, is hopping among the leaf litter on the forest floor. You almost miss seeing it because it is so small, but its bright colors catch your attention and warn of its danger.

A towering giant of a tree has fallen to the ground, creating an opening for the sun. New green shoots spring up, glad for the sunlight. The clearing is different from the rest of the forest. The vegetation is thick and hard to walk through. Your eyes need a little time to adjust to the brighter intensity of the light. The animals and plants here are different species than those that surrounded you in the mature rainforest.

Fungi are everywhere, large and small, pale and tinted, indicating how important decomposers are to a rainforest recycling system. Molds, mildews, mushrooms, and other fungi break fallen leaves and wood into nutrients in this hot, moist environment, making them available for plants to take up through their root systems. The earthy smell of the moist, thin layer of soils reminds you that this is the perfect environment for these decomposers to flourish. The spores of the fungi can travel in the air or on the feet of insects that fly upward. Leaves and twigs decompose in the branches; organic material also accumulates there, helping to block the sun.

Organic material in the treetops allows other plants to grow on the trees. These "air plants" or epiphytes, such as ferns, orchids and bromeliads, don't need soil to survive. As you reach up and touch one, you feel a waxy coating on its leaves and a "drip tip" to remove raindrops rapidly; this prevents moisture from hastening decomposition. In a climate that has an annual rainfall of 120 inches, where an afternoon rain shower is a daily occurrence, plants must adapt to this moisture. Speaking of rain showers, it's starting to cloud up and your raincoat is back home. Return home, but keep your eyes closed. Review all your experiences from your fantasy walk in the Nicaraguan woods. When you are ready, slowly open your eyes.

# Background

Ornithology is the scientific study of birds. The field of ornithology encompasses a wide range of topics and issues concerning birds, including general anatomy and physiology, taxonomy, behavior, distribution, ecology, aesthetic value and economic value.

Classical ornithology probably began with Aristotle who devised a classification system for the known birds, dissected birds to examine and record their anatomy and even studied bird embryos, long before the invention of the microscope. In his work, Aristotle classified about 170 different kinds of birds. This was an amazing accomplishment. One hundred and seventy birds had not even been identified in Europe at that time or during the following century.

Alexander Wilson (1766-1813) is credited with establishing the science of ornithology in America. Wilson conducted a detailed, comprehensive study of living birds in their habitat and published his findings in the first seven volumes of *American Ornithology*. Because of his accuracy, thoroughness, scientific approach and dedication to studying living birds, Wilson is known as the father of American ornithology.

Probably the most well known ornithologist in America is John James Audubon (1785-1851) for whom the National Audubon Society was named. Audubon conducted detailed studies of birds of North America and published *The Birds of America* which included 435 life-size, full-color paintings of 489 species of North American birds. This was followed by *An Ornithological Biography* that provided the life histories of the birds illustrated in *The Birds of America*.

Today, information about songbirds comes from a variety of sources including scientists, land managers, members of bird clubs, backyard bird enthusiasts and students. Ornithology is one of the few sciences where amateur and professionals work together to increase our knowledge of birds and bird populations. In fact many of today's studies of movements, population trends and habitats could not occur without the active involvement of thousands of interested and knowledgeable amateur ornithologists. During any given year there are hundreds of projects going on to help answer questions concerning birds. As more people become interested in and knowledgeable about wildlife and the environment, new scientific investigations are being initiated which rely on the help of amateurs. These citizen scientists provide a valuable service in collecting and reporting data on a wide variety of topics from birds to water quality.

Ornithological projects typically fall into three major categories: inventory, monitoring and research. An inventory is a general survey of bird species located within a given area. The most common use of an inventory is to generate a list of birds inhabiting a specific area. Inventories are based on the identification of bird species from observation or song. Examples of state or nationwide inventory projects are the Audubon Christmas Bird Counts, the Breeding Bird Atlas, and the Special Areas Project. A local project could be the inventory of birds on school grounds or in the schoolyard.

Monitoring involves observing or surveying over a period of time. These projects have very specific procedures that are repeated over a given period of time. One method used in monitoring is called the Point Count Method. In this method participants are assigned a route. At established points along the route, they identify and count all birds, either seen or heard, within a given radius. The Breeding Bird Survey, designed to monitor trends in breeding bird populations, uses this method. Another monitoring method, the Spot Mapping Method, is used to determine estimates of breeding bird density. This method involves establishing a study area, visiting the area several times during the breeding season, identifying birds within the area and plotting their locations on a grid map. An example of a project using this method is the Breeding Bird Census. Both the Breeding Bird Survey and the Breeding Bird Census are done each year along the same routes or in the same study areas.

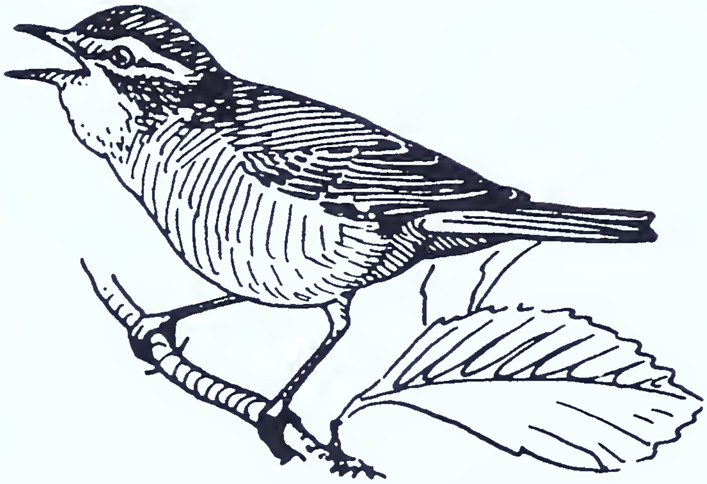
Research is more involved than inventory or monitoring although inventory and monitoring techniques may be used as part of a research project. Scientific research begins with someone posing a significant question or problem. Questions may range from, "What is the nesting site preference of the cardinal?" to "What is the minimum number of contiguous forest acres necessary for a population of wood thrush?" Many different methods of scientific inquiry can be used in research but all of them involve going through a series of steps or stages. These steps will vary depending on the nature of the project but will include some or all of the following: gathering existing information; proposing a hypothesis; designing an investigation; collecting and analyzing data; discussing the results; drawing conclusions and publishing a report. A research project may be entitled the "Reproductive Success of the Ovenbird in Forest Interior and Woodlot" or "Food Preferences of Songbirds in the Schoolyard".

Sharing the information gathered through inventory, monitoring or research projects is very important. All information contributes to the general knowledge base concerning birds and may contribute to management and conservation programs, be the basis of future projects or cause a change in the accepted theories about birds.

In order to study some issues, such as movement and life span, it is important to be able to identify, recognize, and monitor individual birds. With the development of small, lightweight radio-transmitters, it is possible to conduct radiotelemetry projects with songbirds. The miniature transmitters are attached without injury to the bird by gluing or clipping the transmitter to the feathers. The transmitters are powered by a small battery like those used in watches. Through these transmitters, researchers are able to monitor daily movements within a small area or, if a plane is available, follow a bird on its migration. However, these transmitters are usually only effective within approximately one mile and last only about 2-4 weeks.

The most common and efficient method for marking wild songbirds is bird banding. The first recorded bird banding was done by John James Audubon, who captured an eastern phoebe in 1804 and wrapped a small piece of silver wire around its leg. Audubon noticed that this bird returned to the same place the following year. Today, bird-banding, called "ringing" in Great Britain and Europe, involves placing a numbered aluminum band or ankle bracelet around a bird's leg just above the foot. Bands come in many sizes to suit the dimensions of the bird. The band should be relatively loose fitting so that movement is not restricted.

The U.S. Fish and Wildlife Service issues the bands to bird-banders and maintains banding records at its laboratory in Maryland. Besides a unique serial number, all the bands, except those for the hummingbird (these bands are too small), are stamped with a request to advise the U.S. Fish and Wildlife Service should the banded bird be captured, found dead or found injured. Information sent to the U.S. Fish and Wildlife Service should include the serial number, date, location and circumstances in which the bird was observed. The band should only be removed and submitted, along with the information, if the bird is dead. Once the U. S. Fish and Wildlife Service receives the information, the Service provides the finder a report explaining when and where the bird was originally banded and notifies the bander of the circumstances of the recovery.


Redeyed Vireo

Color bands of metal or plastic are also used to mark birds for specific projects, especially those involving population density studies in a given area. These bands are unique to the project and are used in addition to the standard bands. The value of these bands is that they permit sight-identification of individual birds by simply noting the color combination of the bands. Two population studies where colored bands are currently being used are the Louisiana Water Thrush Project at Powdermill Nature Reserve in Pennsylvania and Audubon's Project Puffin in Maine.

All migratory birds are protected by international treaties and federal law. Therefore, songbird banders are required to have a federal permit issued by the U.S. Fish and Wildlife Service. In Pennsylvania, banders must also be permitted by the PA Game Commission. These permits are only issued to highly qualified individuals who have a legitimate scientific reason for capturing and marking birds. When banders place a band on a bird, specific information is recorded. This includes the species of bird; serial number of the band; place and date of banding; the bird's age (whether the current year's bird or an adult) and sex; general condition of the bird, stage or condition of its molt, its weight, etc. Some researchers collect additional data depending on their research project. Since the bird-banding program was established in 1920, over 40 million birds have been banded.

In order to mark a bird, whether with bands or with transmitters, the birds must first be captured. There are several ways to capture songbirds without causing injury to the bird. Baited live traps have been designed to catch birds in cages. These traps vary in size and type of entrance. One simple trap is the baited box. A mesh box is supported on one end with a stick, with string tied to the stick. Seed is placed under the box. The bird eats the seed, the stick is pulled out and the bird is trapped inside the mesh cage. The most commonly used trap for songbirds has a swinging or sliding door entrance. The door springs close when the weight of a bird depresses a bar or pan. Traps using this type of entrance are suitable for catching one bird at a time. Those interested in capturing several birds at a time may use the funnel trap. The funnel trap has no actual door. Rather, the entrance is shaped like a funnel, wide on the outside, narrow on the inside. This allows birds to walk into the baited cages but makes it difficult for them to exit.

An example of a research project that focuses on habitat is the National Audubon Society's Important Bird Areas Project. To learn more, contact Pa coordinator Gary Crossley at 717-763-4985.

The most common method used to capture songbirds for banding is the mist net. This is fine nylon or silk net usually 9m to 11.6m long. Mesh size varies and determines which birds can be caught. The mist net is stretched loosely between two poles, along with a taut frame of twine and horizontal braces called "shelfstrings". With this arrangement of loose net and tight shelfstring the birds fly into the net and are caught in a loose pocket of netting.

There are many different ways birds can be captured and marked for research and monitoring. No matter what method is used it is very important that the bird's welfare be given highest priority. Therefore it is essential that the researcher understand bird behavior and use capture, retrieval and release methods that cause the least possible stress to the bird. Marking techniques should be chosen for their lack of effect on the bird's behavior or physical abilities, their ease in application and their compliance to regulations.

Although bird banding and radio-telemetry have a role in ornithological research, most projects do not involve "hands-on" contact with the individual birds. Many important projects occurring at this time involve studying the basic habitat requirements, including components and minimum acreage for specific species of songbirds. These types of projects need a different approach.

Ornithologists may ask, "What are the specific components of habitat that attract a wood thrush to nest?" In order to pursue an answer, the researchers would have to locate wood thrush nests and then evaluate the habitats where they are located. They would collect information about the nesting sites themselves, e.g., type of vegetation where nest is located and height from ground. They might identify all the vegetation within a certain distance of the nesting site and identify the food sources found within a given area. Once data is collected, it will be analyzed using statistical tests to determine any correlation among the habitat components where each nest was located. Then, one or more key components might be determined.

Although there are many research techniques available to help increase our knowledge of songbirds, all good research has basic requirements. The methods used should be described in detail, the research should lend itself to duplication, and the research design and analysis should be statistically sound.

*See Bibliography for references.*

# Lesson 1

# *In Search Of... Flocking Songbirds*

**Age:** Grades K-6

**Subjects:** Science, math

**Skills:** Observation, inference, graphing, summarizing, recording, data collection, reporting

**Duration:** Variable

**Group size:** Any

**Setting:** Indoors or outdoors

**Key vocabulary:** Flocking, mobbing, behavior, predator

## OBJECTIVES:

Students will identify areas where birds tend to flock together; explain why flocking may be of help to birds; identify birds and classify if songbird or other.

## METHOD:

Students observe birds in the wild, record locations where birds flock and note their behavior of birds in a flock. Older students identify birds and classify as songbird or other.

## MATERIALS:

Data sheet, pencils, binoculars (if available), identification books.

## BACKGROUND:

Flocking refers to the tendency of some birds to gather together in large groups of the same or mixed species. Some birds, like house sparrows, flock all year round while others tend to flock only in the winter or around times of migration. Although most birds do not form flocks during nesting seasons, there are some birds, like egrets, that gather in a colony only for nesting.

Flocking influences the behavior of the birds in the flock. For example, when one bird cries an alarm, the others follow suit. Or, if one bird takes off, the entire flock takes off. In some flocks, there may actually be a dominant bird with "pecking rights". Wintering flocks of chickadees have a pecking order, similar to that of domestic chickens.

Although the flocking behavior is not totally understood, there are several reasons why flocking would be advantageous to birds. The more birds, the greater the number of eyes and ears. This is helpful to spot food sources as well as predators. Some birds, like starlings, will bunch up when a predator is sighted, thus making it difficult for the predator to catch an individual bird. Cedar waxwings have been observed "bunching up" as well. Sometimes birds flock together to actually chase away a predator.

Many have observed crows gathering together to chase an owl or hawk away.

Birds tend to flock in all different places. We may see flocks in fields, on telephone wires, on buildings or bridges, in trees, etc. In Pennsylvania, birds that tend to form the largest flocks in the winter are the cowbirds, red-winged blackbirds, and common grackles. Other flocks might include pigeons, chickadees, cedar waxwings, juncos, doves, house sparrows, starlings, and finches.

## PROCEDURE:

1. Explain to students that they will be ornithologists investigating the places where birds tend to gather together or flock. Ask students to think about any times they saw flocks of birds. Discuss the location of the flocks, the time of year, etc.
2. Take students on a walk around the school, a neighborhood or ask students to look for flocks of birds on their way to and from school.
3. Once a flock is discovered, have students note the location, (field, bridge, building, etc.) observe the behavior of the birds in the flock, and determine if the flock is made up of all one type of bird or many different species. (Students should identify the species if possible). Students should record this information on the data sheet. For younger students, the teacher or an older student can record data.
4. Once collected, have the class summarize the data by making a large chart of all the places birds flocked together, which birds were in the flocks, the behavior of the birds in the flock, weather, season and time of day.
5. Next, have students review the data and determine if there are any similarities or differences in their findings. Ask questions such as: "Are there places that birds tend to flock? Do different species flock in different places or at different times of day?" Create bar graphs based on the information where possible.
6. Then, ask students why they think birds flock. How can flocking help birds?

Consider having younger students draw pictures of places they observe birds flocking.

## EXTENSION:

- Do this activity throughout the year and note if there are any seasons that birds tend to flock.
- Do this activity in conjunction with Lesson 7 from Chapter 5 and count the birds in the flock. Determine if some species tend to form larger flocks than others.
- Research places in the country or the world that birds tend to gather in large flocks. Discuss why birds might flock in those locations and what would be the consequence if these areas were not available to the birds.

## EVALUATION:

- Students make a map of places around their school or in their neighborhood of where birds tend to flock and give reasons why birds might choose those locations to flock.
- Students draw a picture depicting places where birds flock and/or behavior of the birds in the flock.
- Students write or tell a story relating why birds gather together in flocks.

Developed based on ideas from:
Roberts, Janet Wier and Huelbig, Carole, Houston Arboretum & Nature Center. *City Kids and City Critters!* New York: McGraw-Hill.

## STUDENT OBSERVATION SHEET

Name: ______________________________________________

Date: ____________ Time: ______ Weather: ______________

Flock Location: ______________________________________

Mixed flock or one species: ______________ Songbirds? __________

Species: ____________________________________________

Behavior observed: ___________________________________

______________________________________________________

Date: ____________ Time: ______ Weather: ______________

Flock Location: ______________________________________

Mixed flock or one species: ______________ Songbirds? __________

Species: ____________________________________________

Behavior observed: ___________________________________

______________________________________________________

Date: ____________ Time: ______ Weather: ______________

Flock Location: ______________________________________

Mixed flock or one species: ______________ Songbirds? __________

Species: ____________________________________________

Behavior observed: ___________________________________

______________________________________________________

# Lesson 2

# *Feeder Frenzy*

Cornell Laboratory of Ornithology

**Age:** Grades 4-9

**Subject:** Science, math

**Skills:** Analysis, classification, comparison and contrast, discussion, evaluation, observation, synthesis

**Duration:** Three class periods to all semester

**Group size:** Any

**Setting:** Indoors or outdoors

**Key vocabulary:** Experiment, scientific inquiry

Fruits such as chopped apple, banana, and raisins are liked by robins, cedar waxwings, and catbirds.

## OBJECTIVES:

Students will identify common birds that are attracted to bird feeders; use scientific research methods; and draw conclusions concerning birds and their diets.

## METHOD:

Students design and conduct bird feeder experiments throughout the winter.

## MATERIALS:

Bird feeders, various seeds, field guides, paper, pencils, *Bird Feeder Data Sheet* (provided). (Students can make bird feeders; see Appendix for simple examples.)

## BACKGROUND:

Learning to ask good questions is fundamental to understanding the process of scientific inquiry. Scientific research begins with someone posing a significant question or problem. Then, researchers use prior knowledge to make sense of their problem.

The next step is to try to solve the problems. This involves investigation and experimentation. Students can ask any questions; the challenge is to discover ways to answer those questions. Therefore, time must be spent in the design of the investigation and/or experiment. Once implemented, students collect and analyze data and draw conclusions. Reporting and defending the results are also very important steps in scientific research. If researchers did not report their results, there would be no additions to the general body of knowledge in the field.

Attracting birds to the school site is relatively easy. Provide food, water and shelter from weather and predators. Put the food out for several weeks prior to conducting the research activity so that birds have the opportunity to find and become accustomed to the feeders. Feeders are generally a supplemental winter food source, but once the feeding program is underway in the fall, be sure to continue it until spring, even though data is no longer being collected. Vicinity birds learn to anticipate the food source and, in times of severe weather, a well-stocked feeder may be essential for a small bird's survival.

Feeders come in all shapes and sizes and can be bought or built. The most important consideration in any seed-dispensing feeder is that it keeps the seed dry. Wet seed will quickly spoil and can make birds sick, so make sure seed stays dry and fresh, and clean the feeders on a regular basis, especially those with flat feeding surfaces.

Black oil sunflower seeds have more energy than other sunflower seeds and are a favorite of black-capped chickadees, blue jays, and cardinals.

Fatty foods like suet are a good source of energy, but since these foods can go rancid, they should be used only in cool weather. Many bird enthusiasts have a favorite "recipe" for mixing fats and seeds. Students may enjoy creating their own recipes and observing what species they attract. Commercial suet-seed blocks are also available. Many different seeds can be used. Sunflower (black oil and striped), thistle and seed mixtures containing several types of seeds are the most common. Students can also try placing fruit, such as apples, oranges and raisins at their feeders. Different birds will be attracted to different types of food. Placement of the feeders will also affect the birds that are attracted. For additional information, see Chapter 7, Lesson 1.

Small seeds such as white millet, cracked corn, and canary seed are eaten by sparrows and goldfinches.

Once the feeding station is established, the students simply watch and record. Watch for migratory species in the fall and spring. Keep in mind that a bird's plumage in the fall and winter may be considerably different than in spring and summer. With a little practice, students will be able to identify the most common species in the schoolyard. Watch for unusual species, too. During stormy weather, migrating species are sometimes blown off course and may show up at the feeders. "Accidental" species may be difficult to identify; consult a field guide to help with distinguishing features. Unusual sightings may be reported or confirmed to the Pennsylvania Bird Line. (See Appendix.) Refer to Chapter 3 for information on bird identification.

Suet is beef fat and is available at meat markets and grocery stores. Insect-eating birds such as woodpeckers, chickadees, and nuthatches love to eat this high-energy food. Please do not offer suet in the summer, however, as it can become rancid and make birds sick.

Attracting birds to the school will offer the students an opportunity to study a range of interesting bird behaviors. Some birds forage widely and will only be transients at the feeder; others will take up residence as long as there is food. Many species exhibit a pecking order within or between species. In some species, males will dominate females and not allow them to feed at the same time except during mating season, when males may bring food offerings to females. Young birds may be driven off by older ones. Some species may be more aggressive than others. Studying behavior can build a student's skills in careful observation, data gathering and journal-keeping.

Domestic cats can be a problem for feeder birds. Cats learn that feeder birds make easy, regular prey. Cats may also deter birds from coming to feeders. Students should be made aware of this potential problem so they can think about how cats may affect their research. Students should also be aware that certain raptors such as the Cooper's hawk or sharp-shinned hawk may also prey on feeder birds.

Bird-feeding activities can be conducted throughout the school year.

## PROCEDURE:

1. Set up a bird-feeding area where daily observations can easily be made, such as by a classroom window. Choose feeders appropriate to different foods. If there is time, students can make their own feeders. Designs for easy-to-make feeders can be found in the Appendices.
2. Raise the research question: Do all birds eat the same thing? What kind of research project could you conduct to find out? Discuss the many different foods birds will eat at feeders. You may want to concentrate on sunflower seed, thistle seed and a commercial mix that includes white millet and/or corn. Propose that students use feeders to determine feeding preferences of different birds.
3. Split the class into small groups and have each group discuss the design of a project that will help answer this question. Students will have to consider: (1) what feed to use; (2) which feeders to use; (3) which food will be used in which feeder; (4) where the feeders will be placed; (5) the length of time this project will take place; and (6) when and how data will be collected.
4. Have the groups share their ideas with the class and have the class decide on the approach they will use. Make sure students understand that the feeders need to be at the same feeding station. Discuss confounding factors with students. If bird feeders in different locations drew different kinds of birds, how could you tell whether the difference in species was due to the different feeds or the different location of the feeders? Decide how long the experiment should run—throughout the entire winter feeding season would be ideal.
5. Decide on the data collection method and if there are other questions that can be answered at the same time. For example, the initial question may be: Do different birds prefer different foods? Some other questions might be: Do chickadees eat more sunflower seeds than thistle seeds? What time of the day are birds most actively feeding? Is there a relationship between bird size and food preference? Do the bird species that frequent feeders change over the year? How are the bird beaks adapted for the preferred food? The design of a data collection sheet may help students answer more than one question.
6. Review the birds typically seen at feeders in your area and review some of the features to look for when identifying these birds.
7. Assign groups to particular observation days or times (i.e., Group One on Mondays, etc). Everyone needs to know which feed goes in which feeder. (Make sure feeders are checked daily and filled when necessary.)
8. Give the students the specified amount of time for observations, such as two minutes, and tell them the time(s) at which they are expected to check the feeders each day (two to three times a day should work well). Depending on the location and setup of the feeding station, students may need to be warned not to scare off the birds by rushing to the windows.

Sugar solution in a special feeder attracts ruby-throated hummingbirds.

9. Post the data sheet and field guide in the classroom near the feeding station. If you have access to a bird identification poster, place it near the data sheet, too.
10. On the data sheet, student groups should record the following information: date, time, group making the observations, and birds present at each feeder. For recording the bird species, students can tally the individuals of a particular bird species seen during the two-minute period.
11. Discuss the results. Post results for other students to see or have students write an article for the school newspaper.

## EXTENSIONS:

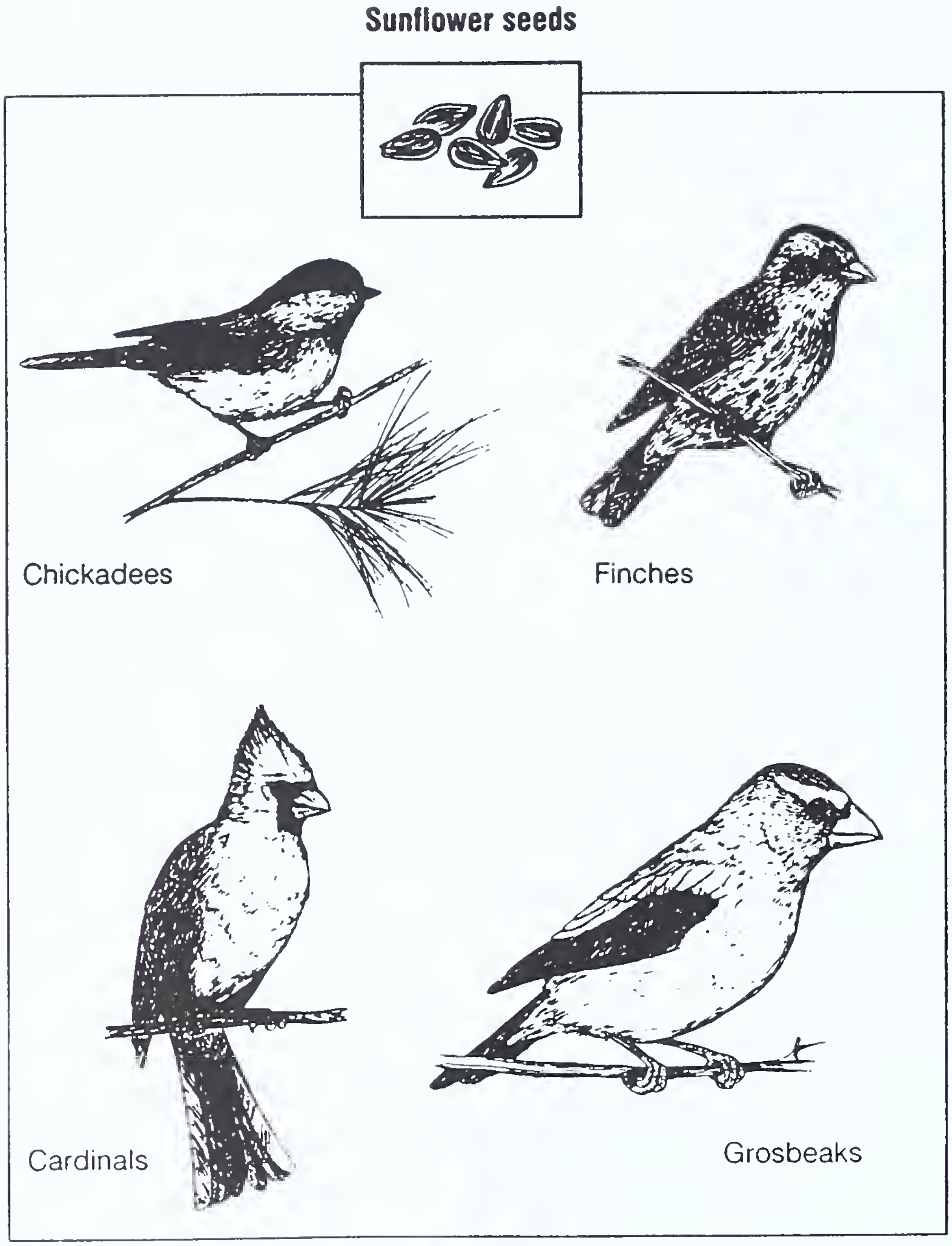
- Refer to Chapter 7, Lesson 1 for extension of this lesson.
- Change the initial question or allow students to create their own research design to find the answers to the questions they pose.
- If no birds come to the feeders, students could investigate possible reasons. They could observe the location, type of feeder, type of feed, and species of bird frequenting other successful feeders and note what is different about theirs. Or students could call stores that sell birdseed and ask questions about the kinds and amounts of birdseed that are sold.
- This activity can be carried out over the entire semester or year. Once it has been set up, data collection can continue over a long period of time. If you keep cumulative records, each year's class can work with data from multiple years.
- To contribute your bird feeding data to a national database, join Project FeederWatch. This project, a joint project of Cornell Laboratory of Ornithology and the National Audubon Society, was organized to collect bird feeding data from children and adults across the United States. For more information about joining Project FeederWatch, call (607) 254-2425.
- Publish the results of the experiments in a class, school, or community newspaper. Create the school's own journal of original scientific research.
- Take the class on a bird-watching field trip. Teach students how to use binoculars and how to identify unknown birds in a field guide. Contact a local National Audubon Society chapter or bird club for a volunteer guide on the field trip.
- Take the class to someone's house or a nature center where bird feeding is "big" business. By asking around school or at the busiest seed store in the area, you should be able to locate someone who feeds birds extensively and who would welcome a visit by the class.
- Encourage students to set up feeders at home. Students could describe the habitat that they have at home, and record birds that come to their feeders. In many communities, free food for birds (such as waste corn and other grains) can be obtained from area grain elevators.

Peanut butter and bacon fat are other foods that suet-eating birds like to eat. (Again, offer only in cold weather.)

## EVALUATION:

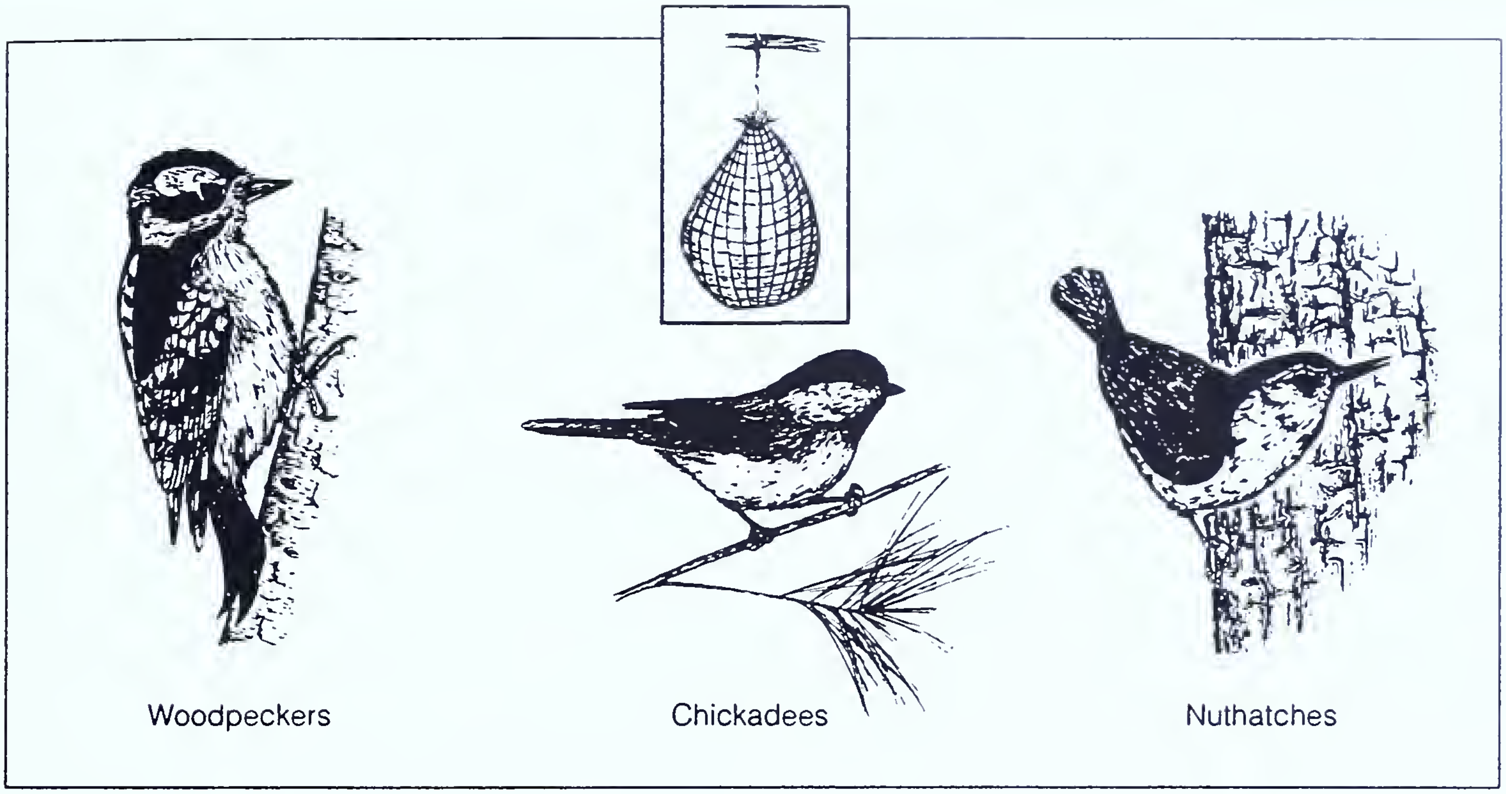
- Review the steps involved in this scientific inquiry. How does this experiment illustrate some ways in which scientific research is done? What is some other research that could be conducted by the class? Encourage students to point out flaws in this research design and ways to improve the quality of the data.
- Have students present and explain the results to students not involved with the project.

Adapted with permission from:
Gilchrist, Susan, Row, Kadi and Borneman, David. *One Bird, Two Habitats*. Wisconsin Department of Natural Resources, 1993.



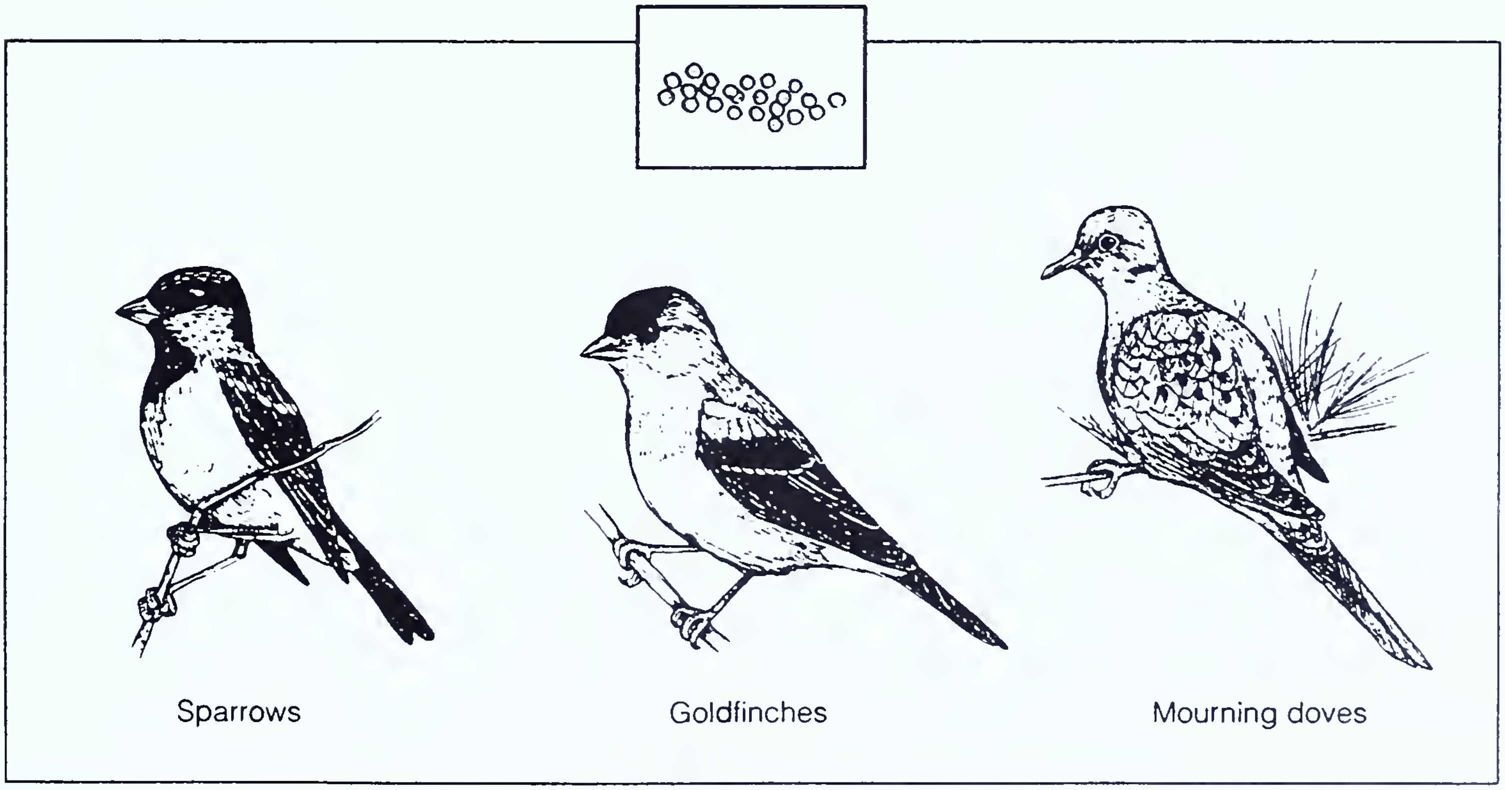
*Cornell Laboratory of Ornithology*

Suet

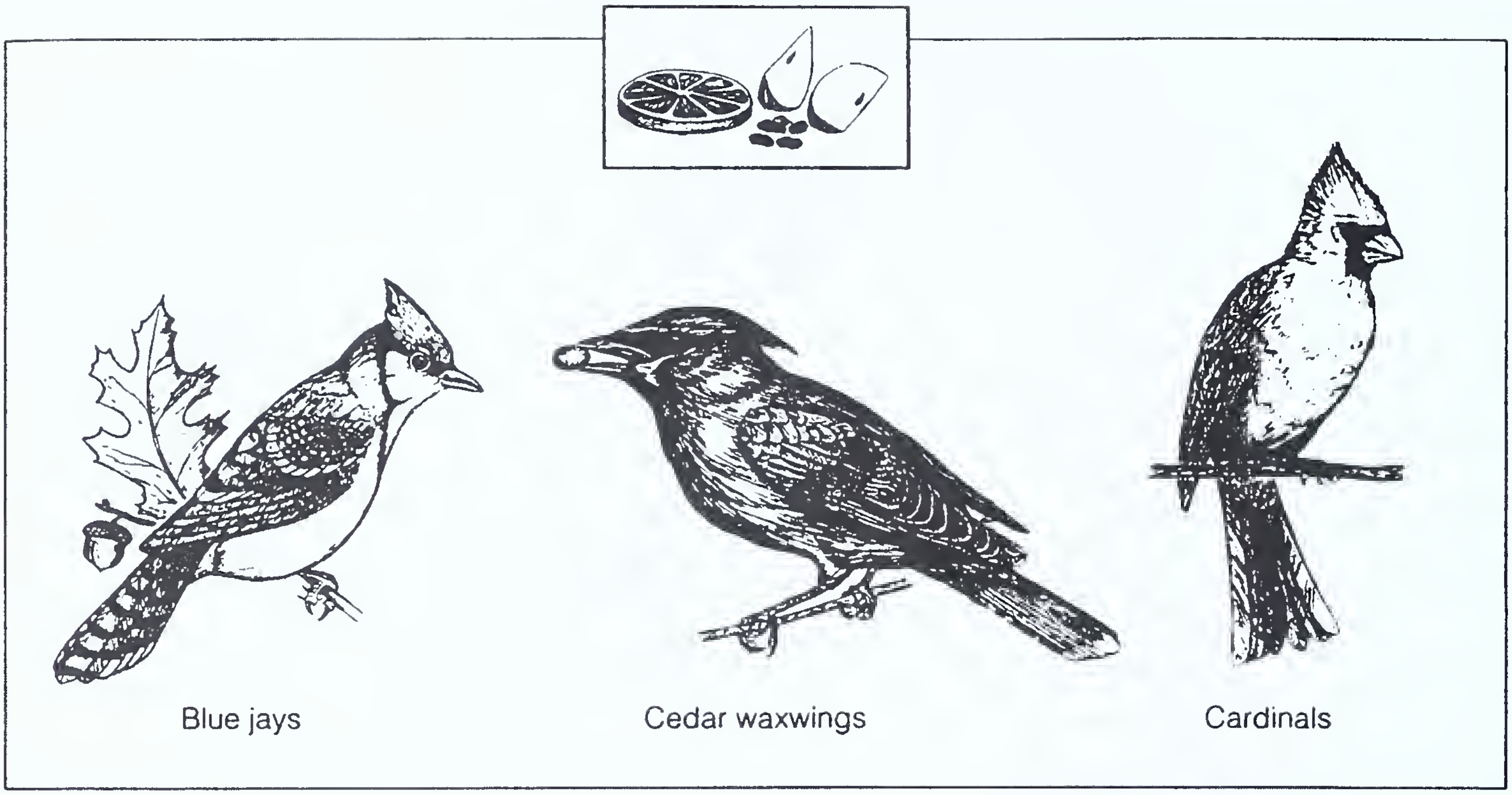


Cornell Laboratory of Ornithology

Millet



**Fruit and Berries**



Blue jays

Cedar waxwings

Cardinals

Cornell Laboratory of Ornithology

## Feeder Frenzy: Bird Feeder Data Sheet

| Date | Time | Observers' Initials | Weather | Feeder 1 (# Species) | Feeder 2 (# Species) | Feeder 3 (# Species) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| | Feeder | Feed |
|---|---|---|
| Type of feeder and feed in Feeder 1 | ________ | ____________ |
| Feeder 2 | ________ | ____________ |
| Feeder 3 | ________ | ____________ |

## BIRD SPECIES AND THEIR FOOD PREFERENCES

| | |
|---|---|
| BLACK OIL SUNFLOWER | Cardinals, blue jays, chickadees, evening grosbeaks, nuthatches, tufted titmice, purple finches, and downy, hairy, and red-bellied woodpeckers |
| SUNFLOWER HEARTS | White-throated sparrows, goldfinches, house finches, cardinals, blue jays, chickadees, evening grosbeaks, nuthatches, tufted titmice, purple finches, and downy, hairy, and red-bellied woodpeckers |
| PEANUT HEARTS | Blue jays, juncos, nuthatches, and downy, hairy, and red-bellied woodpeckers |
| WHITE PROSO MILLET | House sparrows, mourning doves, tree, field and song sparrows, white-throated sparrows, and juncos |
| NIGER THISTLE | Goldfinches, and house and purple finches |
| CRACKED CORN | Juncos, mourning doves, blue jays, white-throated sparrows, and grackles |
| SUET | Downy, hairy, and red-bellied woodpeckers, nuthatches, flickers, and chickadees |
| SUGAR WATER | Hummingbirds |
| FRESH FRUIT | Cedar waxwings, catbirds, orioles, and robins |

Seeds that are not preferred are milo, hulled oats, rape, wheat, and red proso millet.

## Lesson 3

# *Designing Researchers*

**Age:** Grades 7-12

**Subjects:** Science, language arts

**Skills:** Discussion, inquiry

**Duration:** Two class periods

**Group size:** Class

**Setting:** Indoors and outdoors

**Key vocabulary:** Scientific inquiry, inventory, population, distribution, transect, research techniques

## OBJECTIVES:

Students will use scientific inquiry and describe the importance of different research techniques in establishing bird distribution.

## METHODS:

Students design a research project to study the population distribution of a songbird living in their area.

## MATERIALS:

Paper and pencil, songbird identification materials, list of songbirds in the area (optional--tapes of calls of local songbirds).

## BACKGROUND:

In this activity, students review the process of scientific inquiry and the "Three P's": problem-posing, problem-solving, and peer persuasion. Students became familiar with one research design in the "Feeder Frenzy" activity (see Lesson 2). Here, they are asked to take the process a step further and design their own research. For further discussion, see the teacher background material in this chapter.

In this activity, students become biologists who are asked to develop a research project to estimate the population of a specific bird species in their area. The species should be chosen by the teacher or the students based on knowledge of birds found in their area. Students don't have to carry out the actual research, but can share their proposal with class members. The emphasis here is on scientific inquiry. Encourage students to be creative in making proposals to find the answers. Place less emphasis on formal population census-taking and allow students to speculate.

To estimate the number of a species of birds in a particular area, monitoring is done over a period of time, such as ten days. Different methods are then used to census birds in the area. Integral to any census is detailed, accurate journal-keeping.

A Point Count is considered an efficient method for counting birds in forested habitats. At a specified time of day (usually between 5:00 am and 9:00 am), an observer stands in one spot for a specified amount of time (such as three minutes) and records all birds heard or seen within a certain distance. This is repeated at many spots, over the course of several days. The data are recorded on a map.

Strip Transacts are another common method for censusing birds. Strip Transacts are similar to Point Counts, but the observer is moving along a specified path while recording birds seen or heard within a certain distance from the path. This method is more effective in open spaces.

Bird census methods are not infallible. Different researchers may have different abilities to hear or see birds. In addition, bird identification skills vary with the individual. The time of year is important for identifying birds by sound, since birds are more noticeably vocal during the spring mating season. It cannot necessarily be assumed that every male calling is successfully mated. Some birds continue to call in search of a mate. Hearing one bird does not necessarily mean that more are present. Not hearing any birds does not necessarily mean that none is present. It just means that none happen to be vocal or visible during that bird observation time. It is also difficult to ensure that the same bird is not identified more than once, at different times or different places or by different observers. Despite these difficulties, bird census techniques continue to be a relatively successful way to estimate bird populations.

Group proposals should include an introduction (a brief description of the question) and a methods section (detailed procedures for answering the question). For example, one group's proposal might be to select a section of school property, schedule visits to this area over a ten-day period, and count the number of the chosen bird species in the area by walking through the area and stopping every 100 paces to listen for the birds. Peer review of this proposal might include questions such as: What time of year should this be done? Are you also collecting data on the size and type of the habitat you visit?

## PROCEDURES:

1. Review the process of scientific inquiry with students. They will be given a research question by the teacher (problem-posing). They will need to propose a research design to answer the question (problem-solving) and then present the proposal to the class for peer critique (peer persuasion).
2. Divide the class into groups of four to five students. Tell students they will be taking the role of researchers. Have groups propose a method to address the following problem: Research has indicated that bird populations may be declining in some places. To understand more about where bird species of this area are and what may be happening to them, we need data. The problem is to determine which birds are found in this area, select a bird species and determine approximately how many individuals (of the chosen species) live in this area.

3. Student groups should think through this problem and write up a proposal for their research. Make it clear that students will not have to actually conduct the research, so they can think beyond their own immediate resources. Questions such as "How can you tell when the bird is present?" may help prompt student thinking. Students may suggest ways to survey different areas around the school, neighborhood or county to listen for their bird species.
4. How would they know where the appropriate habitats are located in their county? What time of year would they conduct this research? What time of day? Where might they look to for any previous research? They may suggest looking for last year's nests during the winter. How would they know what the nest looks like or where it would be found? Encourage creativity.
5. Give students the rest of the period to design their research proposals. Suggest they use study halls or time after school to conduct any background library research.
6. Have student groups write a formal proposal, then present their ideas to the class for review. Reviewers should be able to point out potential flaws in the research designs and presenters should be able to persuade the class that their designs will work.
7. Discuss how the data to be collected might aid researchers in songbird conservation. Show how this activity follows a process of scientific inquiry necessary for any research. Incorporate information on bird censusing techniques into the discussion.

## EXTENSIONS:

- Students actually implement their research projects.
- Students conduct a Point Count survey in their area.
- Contact the Pennsylvania Game Commission, Pennsylvania Society of Ornithology or National Audubon Society's Pennsylvania field office to find out about bird research underway. Pair students with experienced birders to participate in a bird census.

## EVALUATION:

- Assess group proposals based on how well they would address the research question.
- Evaluate students' abilities to persuade class members of the merits of their proposal.

Adapted with permission from:
Gilchrist, Susan, Row, Kadi and Borneman, David. *One Bird, Two Habitats.* Wisconsin Department of Natural Resources, 1993.

## Lesson 4

# *Buddy Banding*

**Age:** Grades 7-12

**Class Time:** 20 minutes class time on each of two days

**Subjects:** Science, math

**Skills:** Classification, observation, data collection, summarizing, reporting

**Group Size:** Class or more

**Setting:** Indoors

**Vocabulary:** Bird-banding, scientific inquiry, data

## OBJECTIVE:

To identify and describe the role of bird-banding in research; and to design and conduct a research project using which involves banding.

## METHOD:

Students will participate in a simulation research activity that involves banding fellow classmates.

## MATERIALS:

Construction paper or strips of material; masking tape; paper and pencil.

## BACKGROUND:

Bird-banding is the art and science of capturing, marking and releasing wild birds for research. Biologists have been marking birds for study for more than 100 years. The first record of anyone marking a bird for study was that of John James Audubon, who captured an eastern phoebe in 1804 and wrapped a small piece of silver wire around its leg. He noted that the same individual bird returned to the same place the following year. Today, bird-banding involves attaching a tiny aluminum bracelet to a bird's leg, just above the toes. This is a loose fitting band that does not harm the bird or restrict its movements. Much of the details of the lives of birds are known only because of observation and banding efforts of scientists around the world.

Why do we band birds and what do we learn from banding? To discover which kinds of birds live in a particular area or habitat, we could walk the area throughout the year and watch for different species. With the aid of a good field guide and plenty of practice, we should be able to identify all of the birds that come to an area. However, some birds are hard to see, especially in summer when the leaves are thick.

How do we know which is which and how many birds there are in the local population? Color marking, with the use of bands, helps provide the answers.

Some birds that nest in Pennsylvania travel as far south as the tropical rainforest, while others fly only to Mexico or the southern United States for the winter. Do these birds winter in a very specific area? Are they threatened with loss of habitat on their wintering grounds? By marking individuals and seeing where other biologists catch them, we can learn about bird travels. But this knowledge is dependent upon catching the same bird twice. Many birds that are banded are never recaptured. Researchers here and in Central America both band birds and share information.

One typical method used by researchers to catch birds for banding is mist netting. A fine net is stretched across an area where birds are likely to fly. Birds are caught when they fly into the net. A researcher then collects data on the species of bird, its age and sex, and takes measurements. The bird is banded and then released. Each band is coded with a unique identification number.

Many birds that have been banded die without the researchers knowing where or when they died. If you ever find a dead bird with a band on its leg, you should notify your local Pennsylvania Game Commission office or the U.S. Fish and Wildlife Bird-Banding Laboratory. Record the entire number on the band, the date you found the bird, the species (if known), and the exact location. Send this information (along with the band, if possible) to: Chief, Bird-Banding Laboratory, Office of Migratory Bird Management, U.S. Fish and Wildlife Service. Laurel, MD 20810.

With such a high percentage of natural losses, further decline in bird populations may threaten their continued existence. We can help birds best if we understand where they live, what they need, and where they travel. Banding is one technique that provides us with the essential information we need to manage habitat for bird conservation.

## PROCEDURE:

1. Begin a class discussion on bird-banding. How do biologists know where birds fly for the winter? How do scientists know which birds go where, when most individuals of the same species look similar? How would banding birds facilitate gathering information? Explain that the students will have the opportunity to see what it's like to be a bander and to be a bandee. However, because it requires special equipment, special permits from the federal government, and lots of training, they will not actually be banding birds; they will be banding people!
2. Review the method of scientific inquiry. As a class, select a research question, such as: Where do students go at lunch time? Or, where are the students from the participating class during the last period of the day? Or, how many students from the participating class use the front door to leave the school building at the end of the day? More than one question may be pursued during the data collection, as is often done in real life research. Tell the students that they will need to collect data to answer their question.

3. Divide the class into "researchers" and "migratory birds" with a ratio of approximately one researcher to five birds. Band student "birds" with numbered construction paper anklets and instruct them to go through the school day in their normal fashion. (If you are doing this activity with several classes at once, use different color bands for each class. If a large percentage of the students in the school are participating in the activity at once, it would be more realistic if the number of banded "birds" were reduced to two out of every five.)
4. Give each researcher a "banding permit" that gives permission to do this activity. Researchers then set up imaginary mist nets. For example, researchers can stand in a selected hallway to catch migrating students, recording the number and color of the band, the time, location and whether or not they had been caught before, and any information necessary to the research question. Emphasize to the student "birds" that they shouldn't change their daily activities on account of the research project, or they will be invalidating data. Because birds are not usually confined to hallways when they travel, they may fly over or around the mist net without necessarily knowing it's there, student researchers should agree to accept a handicap, such as only stopping every fifth person who passes them.
5. The next day, have students organize the data and present their findings to the class. This could be a good opportunity to incorporate math skills, such as fractions, probability and graphing. Students could calculate what percent of all "birds" migrated outside during lunch and what percent were caught by the library, then graph the results. Some questions may require more "field work" to collect data. If any new banding is required, students need to request a new banding permit.
6. Discuss the process of scientific inquiry. Relate this to how students used scientific inquiry to answer their research question.
7. Ask "researchers" to share some of the problems they encountered in banding "birds. Compare these to the problems bird-banders might face. Discuss the benefits and limitations of obtaining data on birds from banding.

## EXTENSIONS:

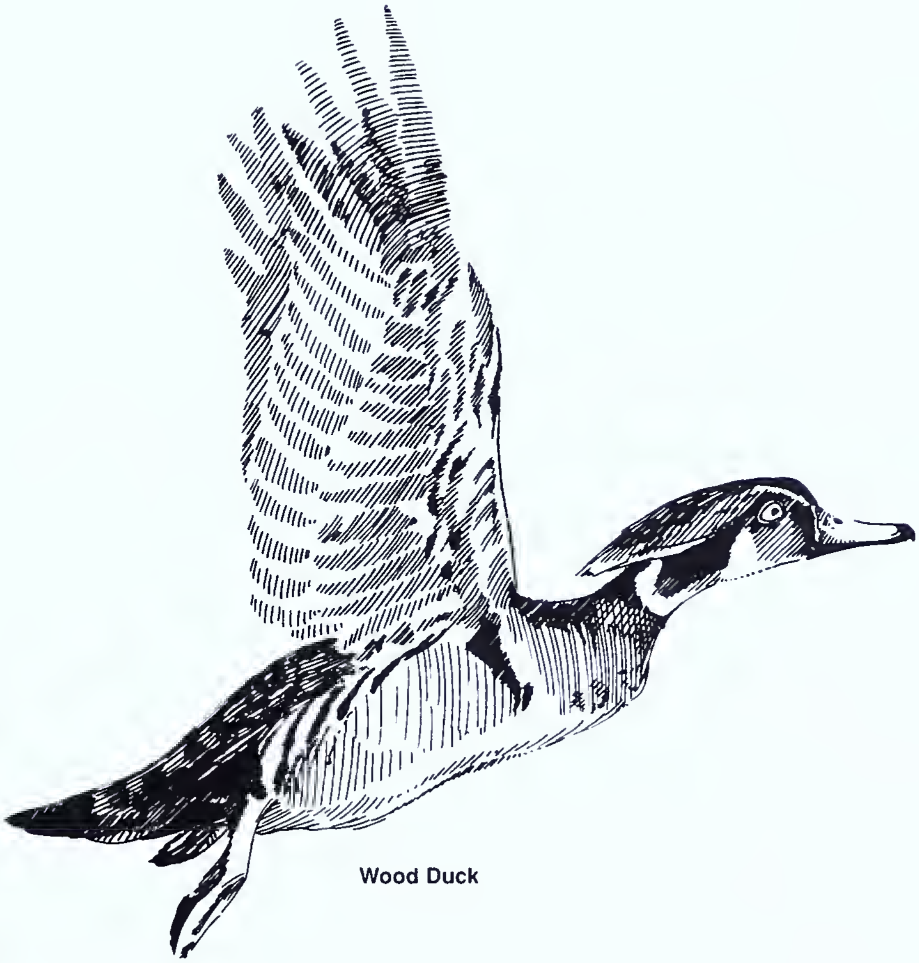
- To really simulate what happens in bird-banding, several different parties should be monitoring the same banded students at different times. Have two groups of students (or two classes) collect data on the same banded students at different times of the day or week.

## EVALUATION:

- Summarize the findings of the study. Did the research answer the original question? How could the study have been improved to increase the accuracy of the findings? Who else might be interested in your findings?

- Compare and contrast this bird-banding activity with the type of research bird-banders conduct.

Used with permission from:
*One Bird, Two Habitats,* by Susan Gilchrist, Kadi Row and David Borneman. Wisconsin Department of Natural Resources, 1993.



**Wood Duck**

# Lesson 5

# *Migratory Mapping*

**Age:** Grades 6-8

**Subject:** Social studies, science

**Skills:** Communication, gather, organize, analyze, interpret and apply data

**Duration:** One to two class periods

**Group size:** At least two whole classrooms

**Setting:** Indoors

**Key vocabulary:** Bird-banding, migratory, trends

## OBJECTIVES:

Students will demonstrate a general understanding of bird migration; list hazards to migrating birds; outline on a map the range and migratory routes of the wood thrush and Swainson's thrush; and explain the uses of bird-banding in research and monitoring.

## METHOD:

Using maps and research data, students chart the migratory routes of two Pennsylvania songbirds.

## MATERIALS:

Two bags, hats or other receptacles; colored pencils, pens or markers; *Wood Thrush Banding Record Data Sheet; Swainson's Thrush Banding Record Data Sheet;* western hemisphere map; paper and pencils; background sheets on wood thrush and Swainson's thrush taken from *Pennsylvania Breeding Bird Atlas* (see Appendix).

## PROCEDURE:

1. Copy *Wood Thrush Banding Record Data Sheet* and *Swainson's Thrush Banding Record Data Sheet.* Cut banding records into individual strips. Put all 25 Swainson's thrush banding records into one container and all 25 wood thrush banding records into another container. (Note: Band records are based on hypothetical data using actual ranges, migration routes, and causes of recovery.)
2. Have students divide into two groups, one representing the Swainson's thrush and the other representing the wood thrush.
3. Have each student take five or six individual records, or until all records have been taken.
4. Distribute one copy of the western hemisphere map to each student.
5. Tell the students they will be wildlife biologists for the class period. They are being sent data on the banding and recovery locations of the wood thrush and the Swainson's thrush. Their job will be to plot the banding

records on a map and to determine each thrush species' migratory route based on the plot locations.

6. Have students plot the locations of banding and recovery records on their individual maps. Higher grades can use different colors representing each of the four seasons for banding and recovery locations. While color coding is not necessary, it will help indicate seasons when the birds are on their breeding grounds and times when they are on the wintering grounds. June and July records are from the breeding range; August to October records illustrate fall (southward) migration; November to March records are from the wintering grounds; and April and May are spring (northward) migration.
7. Once they have plotted their data on their individual maps, have students combine data of banding and recovery locations with others in their group to create one master map per group. The class should now have one master map of the wood thrush banding data and a master map of Swainson's thrush banding data.
8. Discuss each map with the class. Can students distinguish the migratory routes based on the locations of the banding records? Draw an outline around the migratory routes. Discuss differences and similarities of the wood thrush's migratory route and that of the Swainson's thrush. Have several of the students share their banding records with the rest of the class to see examples of how banded birds are "recovered."

## EXTENSIONS:

- Teach the "Migratory Mapping" activity to the entire class by using an overhead projector transparency to project the western hemisphere map on the wall. Simply copy the map of the western hemisphere on a plastic transparency. Plot all the band records on the map using small squares for the wood thrush and small circles for the Swainson's thrush. Again, use different colors to indicate the seasons birds are found in their breeding and non-breeding ranges. When the locations are all plotted, draw lines in the appropriate colors around the breeding and non-breeding areas of each species and link the two to indicate migration routes.
- Arrange a visit to a nearby bird-banding station. Contact a nearby National Wildlife Refuge, Pennsylvania Game Commission or the Institute for Bird Populations (415-663-1436), for information on banding stations nearby.
- Having tracked the migration of two thrush species based on hypothetical banding records, why not participate in real world research to track migratory species as they move northward across the continent? *Journey North* is a comprehensive curriculum of lessons and activities that allow students to explore the phenomenon of migration through on-line, Internet networks. A component of *Journey North,* the Internet Field Team, provides students on-line, daily news reports on various topics relating to migration, as well as activities such as contests and challenge

The Purple Martin Conservation Association follows the migration of purple martins. To learn more or to provide information on purple martin sightings, contact Purple Martin Conservation Association, Edinboro University of PA,
Edinboro, PA 16444
814-743-4420
e-mail: pmca@edinboro.edu
http://www.purplemartin.org

questions. Students in classrooms across the country communicate with one another on the Internet to participate in these activities. For more information, see *Journey North* in Appendices.

- Hand out *Breeding Bird Trends of Pennsylvania* (see Appendix). Explain how data was obtained through Breeding Bird Survey Routes (for more information on techniques, see Background section, Chapter 5).
- Have students answer the following questions:
    - Which bird populations are declining? Why do you think this is so?
    - Which are increasing? Why?
    - Which warbler is most plentiful in the state?
    - Which bird populations seem to be most constant over time?

## EVALUATION:

- Distribute bird identification guides and ask students to compare the ranges of thrushes indicated in the guides with those represented on the class map. How similar are the two maps? Why might they be slightly different?

Adapted with permission from:
*Migratory Bird Issue Pac.* U.S. Fish and Wildlife Service, 1995.
Brauning, Daniel. *Pennsylvania Breeding Bird Atlas.* 1992.

## WOOD THRUSH BANDING RECORD DATA SHEET

| DATE | SIGHTING |
|---|---|
| 6/28/89 | Swainson's thrush banded in northwestern California |
| 1/93 | Swainson's thrush banded in central Colorado on July 17, 1991, found dead in Peru by an indigenous person in the tropical forest. The band was eventually returned with a description of the recovery location to the Bird-Banding Laboratory (BBL) in Laurel, MD |
| 2/3/92 | Swainson's thrush banded in southwestern Mexico |
| 9/86 | Swainson's thrush banded in southwestern Alaska in early July 1986 recovered in southeastern British Columbia after it flew into the window of a private residence |
| 6/11/84 | Swainson's thrush banded in northeastern Quebec |
| 12/19/93 | Swainson's thrush banded in Guatemala |
| 4/26/91 | Swainson's thrush that was banded with a unique combination of three colored leg-bands by a researcher studying bird behavior in central Saskatchewan on June 11, 1989, re-sighted by a bird-watcher in northwestern Oklahoma |
| 5/11/93 | Swainson's thrush banded in West Virginia |
| 6/27/89 | Swainson's thrush banded in south-central Montana on June 11, 1988, subsequently recaptured at the same site on the following dates: 6/27/89, 7/13/90, and 6/20/92 |
| 9/29/93 | Swainson's thrush banded in north-central New Mexico |
| 7/86 | Swainson's thrush banded in southwestern Northwest Territories |
| 4/11/94 | Swainson's thrush banded in western Oregon on May 31, 1981, killed as it flew into a lighthouse on the central California coast |
| 7/7/92 | Swainson's thrush banded in north-central Pennsylvania |
| 5/9 | Several Swainson's thrushes found dead on an oil platform off the coast of Louisiana in early May following the passing of a cold front with heavy rains over the Gulf of Mexico |
| 7/23/91 | Last recorded sighting of Swainson's thrush banded in central Ontario in June 1980; was recaptured at the same site many times over several years prior |
| 8/93 | Swainson's thrush banded in northern Wisconsin |
| 11/92 | Swainson's thrush banded in Massachusetts on June 17, 1991, recaptured in Cuba |
| 8/3/92 | Swainson's thrush banded in northern Nevada |
| 9/89 | Swainson's thrush banded in central Alberta during the summer of 1987 killed by a cat in southwestern Colorado; discovered and reported by the cat's owner |
| 1/94 | Swainson's thrush banded in Colombia, South America |
| 6/91 | Swainson's thrush banded in central Yukon |
| 7/7/94 | Swainson's thrush banded in western Washington |
| 12/31/92 | Second capture in El Salvador of Swainson's thrush banded in northwestern British Columbia on June 31, 1991; also recaptured September 16, 1991, in southeastern Arizona |
| Summer 1994 | Swainson's thrush banded in central Idaho |
| 6/13/94 | Swainson's thrush banded in central Manitoba |

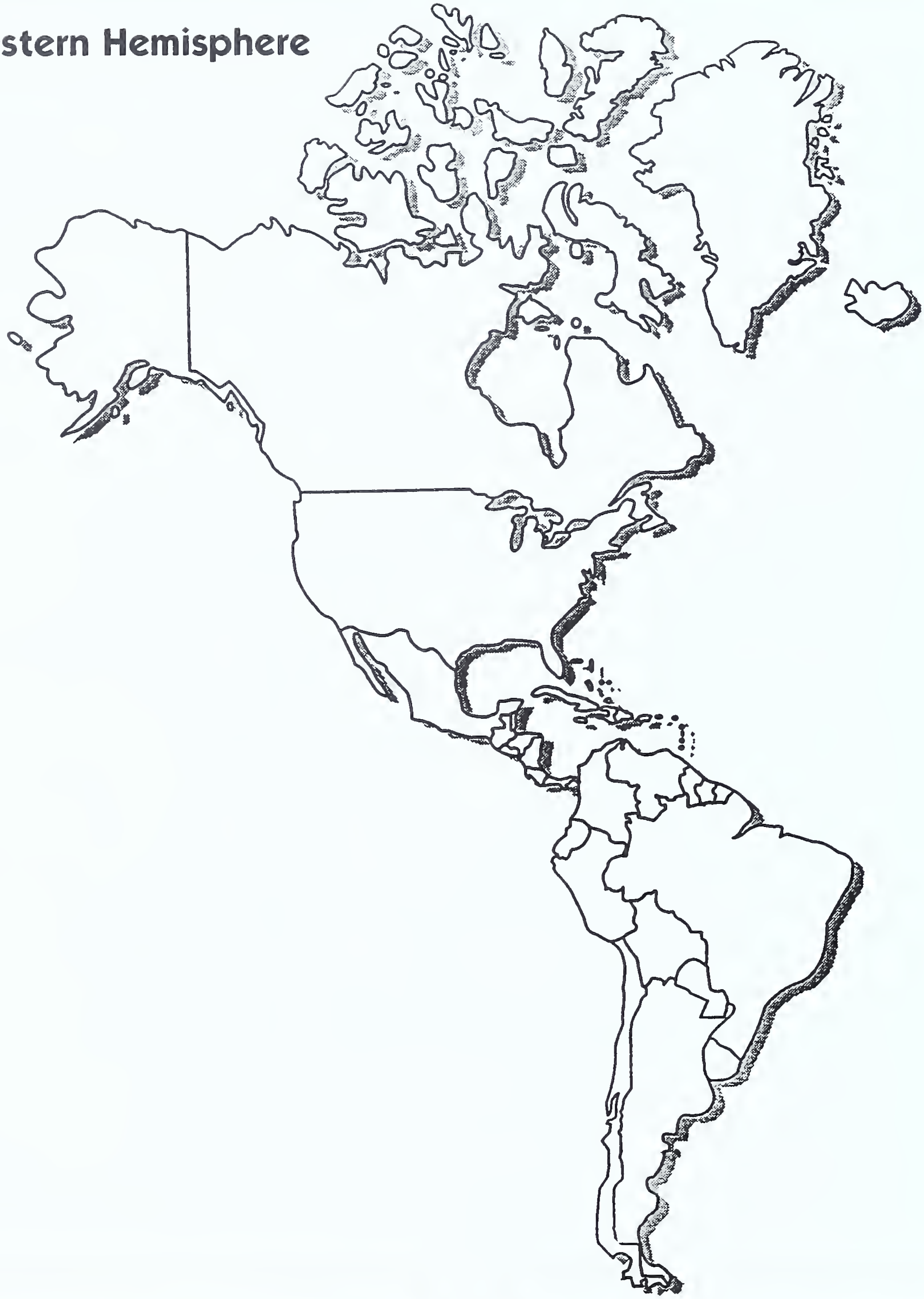
## WOOD THRUSH BANDING RECORD DATA SHEET (continued)

| DATE | SIGHTING |
|---|---|
| 6/21/94 | Wood thrush banded in central New Brunswick |
| 4/13/94 | Wood thrush banded in southeastern Ontario on June 12, 1993, recaptured in coastal Alabama |
| 7/18/92 | Wood thrush banded in central Wisconsin |
| Summer 1994 | Wood thrush banded in eastern North Carolina during the summer of 1990, recaptured at the same site in 1992 and again in 1994. |
| 6/18/91 | Wood thrush banded in Honduras on January 17, 1991, recaptured in southwestern Pennsylvania |
| 7/1/94 | Wood thrush banded in eastern Nebraska as a juvenile on June 30, 1993, recaptured in eastern Kansas |
| Summer 1980 | Wood thrush banded in northwestern Florida |
| 6/1/89 | Wood thrush banded in northeastern Texas on May 29, 1980, recaptured at the same site |
| 11/21/94 | Wood thrush banded in southern Mexico. "Timber-harvesting" began in the forest in which it was banded later that same winter. A large tract was completely cleared within six months. |
| 6/9/91 | Wood thrush banded in Panama on February 17, 1991, recaptured in central Tennessee |
| Summer 1993 | A biologist monitoring the nest of a pair of wood thrushes he banded in central Minnesota found that, although no young wood thrushes were successfully raised, the pair did successfully raise one brown-headed cowbird. |
| 8/30/94 | Wood thrush banded on June 29, 1994, in central New York, recaptured in southwestern Virginia |
| December 1993 | Wood thrush banded at a MAPS station in western Ohio during the summer of 1991, recaptured in Costa Rica |
| 8/5/94 | Wood thrush banded in eastern Georgia |
| 6/17/91 | Wood thrush banded in southeastern Quebec |
| 10/1/93 | Wood thrush banded on July 27, 1993, in Delaware recaptured on the northeastern Texas coast |
| 7/19/83 | Wood thrush banded in central Oklahoma. The study site on which it was banded was not used after this year, as construction for a residential development began in 1984. |
| Summer 1988 | Wood thrush banded in south-central Pennsylvania on August 11, 1987, found dead near the original banding location, having been killed by a cat |
| 6/1/94 | Wood thrush banded at MAPS station in eastern Kentucky |
| 8/29/85 | Wood thrush banded in central Mississippi on June 21, 1985 re-sighted in Mississippi |
| 6/3/94 | Wood thrush banded in central South Carolina |
| Summer 1991 | Wood thrush band sent in from Illinois with no information about recovery or cause of death. The bird had been banded on August 31, 1991, in northwestern Ohio. |

## WOOD THRUSH BANDING RECORD DATA SHEET (continued)

| DATE | SIGHTING |
|---|---|
| 8/9/89 | Wood thrush banded in central Maine; it was later recovered after it flew into the window of a residence in Connecticut. |
| 6/89 | The nest of a banded pair of wood thrushes in southeastern South Dakota was monitored. No eggs were hatched as the nest was disturbed by a raccoon. |

## Western Hemisphere



Source: *U.S. Fish & Wildlife Migratory Birds Issues Pac, 1995*

# WOOD THRUSH

*Hylocichla mustelina*

The Wood Thrush is by far the best known and most widely distributed of the spot-breasted thrushes in Pennsylvania. Atlas volunteers found it in every county of the state and in 4,493—or 91 percent—of the 4,928 blocks surveyed.

Several early writers (e.g. Stone 1894, Harlow 1913) listed the Wood Thrush as a common summer resident in southern Pennsylvania but rarer in the northern counties—a situation that no longer prevails. In fact, Robbins, Bystrak, and Geissler's distribution map (1986) indicates that the center of abundance in Pennsylvania is now in the eastern part of the Allegheny High Plateau and the adjoining western Glaciated Low Plateau sections. The Breeding Bird Survey (BBS) recorded between 31 and 100 thrushes per route in these areas.

The Wood Thrush's breeding habitat is somewhat varied, but several authors have reported that the bird is most common in moist, lowland deciduous forests, often near a stream (Weaver 1939; Todd 1940; Trautman 1940). Other authors suggest that drier woodland is an equally suitable habitat for this species in some localities (Brackbill 1943; Bond 1957; Mengel 1965). All authorities agree on the importance of a well-developed understory of shrubs or saplings. The species apparently prefers larger tracts of woodland habitat. Bond (1957) recorded the Wood Thrush very infrequently in 15- to 35-acre (6 to 14 ha) woods but commonly in woods larger than 80 acres (32 ha).

Weaver (1939) considered the presence of water to be essential because the birds use mud and damp plant material to construct their nests. In some of the state's more mountainous parts, Wood Thrushes are most frequent in forested ravines, where they may nest in a streamside rhododendron thicket (Burleigh 1931). Sutton (1928a) wrote that this species was not found in the dense hemlock woods in the Commonwealth's wilder sections, and Weaver (1939) mentioned that she never found a nest in a conifer in her study area near Ithaca, New York. At Tamarack Swamp in Clinton County, Pennsylvania, however, Reimann (1947) recorded many nests, all in hemlocks; across the state line in Allegany State Park, New York, the birds also were reported to be rather partial to young hemlocks and were found wherever groups of such trees thrived (Saunders 1942).

Some Wood Thrushes choose to nest on a dry hillside or in a thicket near the edge of the woods; still others may be found breeding in city parks, orchards, or near houses in the suburbs or in small towns and villages. Although the Wood Thrush originally was considered a bird of the deep forest (Rehn 1903; Todd 1940), Weaver (1949) used the literature to trace the species' adaptation to nesting sites near human habitation and found that this change took place mostly during the 20-year period from 1890 to 1910.

Todd (1940) remarked that Wood Thrushes build their nests shortly after the birds arrive from their tropical wintering grounds. He found a full set of eggs (presumably in Beaver County) on the early date of 10 May, whereas Sutton (1928b) located a nest at Pymatuning with young birds near fledging as late as 22 August. Of 31 sets of eggs collected in Berks County, dates range from 19 May to 16 June (Poole 1947).

The nest is typically placed in the fork of a sapling or on a horizontal limb of a tree some 6 to 50 feet (2 to 15 m) above ground (Weaver 1939; Todd 1940; Harrison 1975), and usually contains three or four eggs. The Wood Thrush is normally double-brooded (Brackbill 1943, 1958; Harrison 1975). Considering the species' long nesting season and conspicuous behavior during the breeding season, it is perhaps a little surprising that Wood Thrushes were "confirmed" in only about 20 percent of the blocks in which they were recorded. More frequently they were listed as "probable" (48% of blocks) by their territorial behavior or merely as "possible," having been seen or heard in breeding habitat within Atlas safe dates. Nonetheless, Atlas volunteers found this thrush widespread throughout the Commonwealth.

Robbins, Bystrak, and Geissler (1986) reported a "significant increase" in the number of Wood Thrushes recorded on Pennsylvania BBS routes between 1965 and 1979. This was an encouraging trend for a species that is both a woodland nester and a neotropical migrant. However, more re-

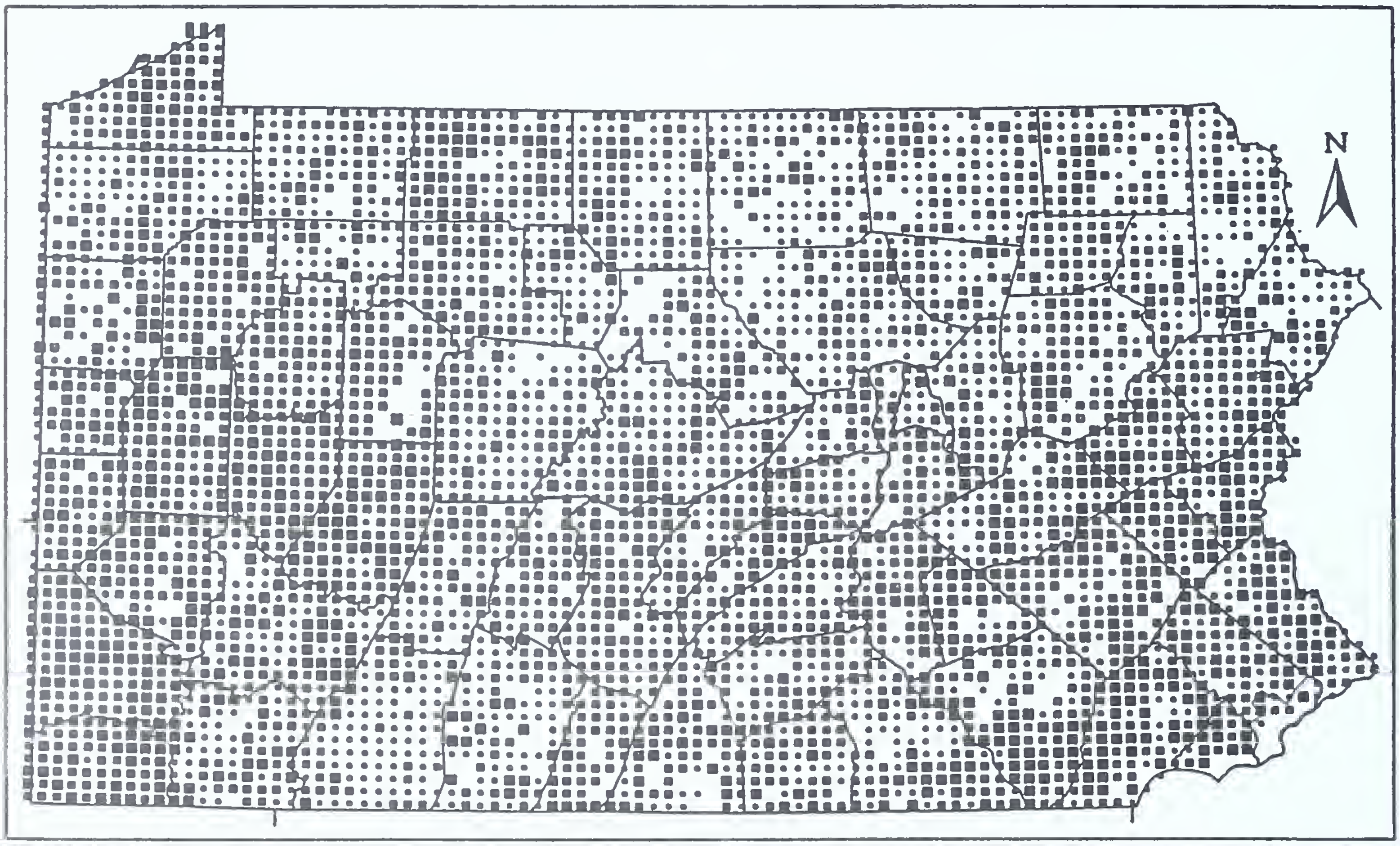
Source: *Brauning, Daniel - PA Breeding Bird Atlas*

## WOOD THRUSH

### WOOD THRUSH

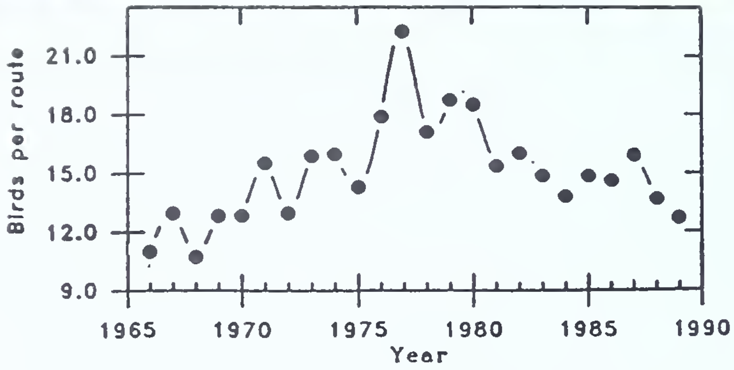
| | No. | % of Total | Priority Blocks |
|---|---|---|---|
| No. of Blocks in Which Recorded | 4,493 | 91 | 96 |
| ▪ Possible | 1,464 | 33 | 29 |
| ■ Probable | 2,133 | 47 | 49 |
| ■ Confirmed | 896 | 20 | 22 |

| Physiographic Regions in Which Recorded | No. | % of Region |
|---|---|---|
| Appalachian Plateau | 1,809 | 89 |
| Pittsburgh Plateau Section | 834 | 96 |
| Blue Ridge | 47 | 100 |
| Central Lowland | 31 | 89 |
| Coastal Plain | 23 | 62 |
| New England | 39 | 89 |
| Piedmont | 440 | 93 |
| Valley and Ridge | 1,270 | 91 |



cent studies have raised concerns about the reduced survival of Wood Thrushes on their wintering grounds because of deforestation (Rappole, Ramos, and Winker 1989; Winker, Rappole, and Ramos 1990). BBS data through 1987 in Pennsylvania failed to show a continued upward trend (USFWS unpub. BBS data; see graph). The Wood Thrush's future as a nesting species in Pennsylvania will always hinge, of course, on the availability of suitable woodland nesting habitat remaining within the state.

—Robert C. Leberman



POPULATION TREND FROM USFWS BREEDING BIRD SURVEY ROUTES IN PENNSYLVANIA

Source: *Brauning, Daniel - PA Breeding Bird Atlas*

# SWAINSON'S THRUSH

*Catharus ustulatus*

Although it is a common spring and fall migrant through Pennsylvania, the Swainson's Thrush is the state's rarest nesting thrush. Its ascending flutelike notes were heard in fewer than 1 percent of Atlas blocks statewide.

This is a bird of northern forests. Studies reveal that a high percentage of conifers is an important component of the species' preferred habitat (Webb 1977). Throughout its range, the Swainson's Thrush generally is associated with mixed or conifer forests, particularly spruce but also hemlock (Bent 1949). This thrush nests in the shrub layer (Clark, Euler, and Armstrong 1983).

Not until Warren published his landmark volume in 1890 was the Swainson's Thrush regarded as a breeding bird in Pennsylvania. This late date probably reflects a lack of ornithological knowledge of the state's presettlement forests rather than a scarcity of the species. The few existing hints of the bird's presence before the original forests were cut indicate that the species was a locally common breeder. Cope (1901) stated that the Swainson's Thrush was "far and away the most abundant of the thrush family in the Tamarack Swamp" of northern Clinton County, and Dwight (1892) reported it as quite abundant on North Mountain, Sullivan County. Todd (1940) speculated that the species' range in northern Pennsylvania's High Plateau may have been continuous with the extant population in West Virginia's spruce forests, although no early accounts list the bird in the southwestern part of the plateaus in Pennsylvania.

By 1947, Reimann had not found the species at Tamarack Swamp (Reimann 1947), and Street (1954) regarded the bird as a "former" nester on the Pocono plateaus. Todd attributes the thrush's decline to deforestation, a sentiment many others shared (e.g. Hall 1983). The species' tolerance of and even preference for second growth and forest edge, however, make the cause of the decline ambiguous. Early Pennsylvania authors considered the species to be most abundant in presettlement forests. However, Bent (1949) and others, such as Carter (1904) in Monroe County, considered the bird more common in smaller trees of border and bushy second-growth areas. The presence of conifers may provide the best explanation of these conflicting reports. Heavy cutting and fires depleted these softwoods in the state early in the 20th century. Pine and hemlock were virtually eliminated (Considine and Powell 1980). Second-growth forests in Pennsylvania tend to be deciduous rather than coniferous (Martin pers. com. 1990). The thrush may prosper in second growth where conifers predominate, as Webb (1977) has documented for Ontario, and Hall (1984) for West Virginia. Pennsylvania, however, has lost much of this forest component.

Atlas volunteers recorded the Swainson's Thrush in many of the historic counties, such as Potter, Warren, and Sullivan counties. They did not find it in other localities, notably Tamarack Swamp, Clinton County  where it once was considered most common. The species was found most often in state and national forests in the higher parts of the Allegheny High Plateau Section. Records came almost exclusively from the northern hardwoods forest above elevations of 1,000 feet (304 m). Specific locations range from the edge of a clearcut (SSR) to the depths of one of Pennsylvania's remnant virgin forests—Heart's Content in Warren County (SSR). Almost all Atlas Special Species Reports mention hemlock, either as dense undergrowth stands or as mature trees. It is interesting that most SSRs indicate that a single bird was heard at the location reported—in notable contrast with historical reports of the species' localized abundance.

The low confirmation rate reflects the difficulty of seeing this bird. Many records were based strictly on vocalizations, which are distinct. Because of the species' shyness and specialized habitat, it can be easily overlooked. It seems reasonable to presume that the Swainson's Thrush may have been present in extensive areas of older forests on the Allegheny High Plateau Section where it was not recorded. However, this species was probably always spotty in distribution, with particular habitat requirements that may not be fully apparent. This thrush was not present in the southern extension

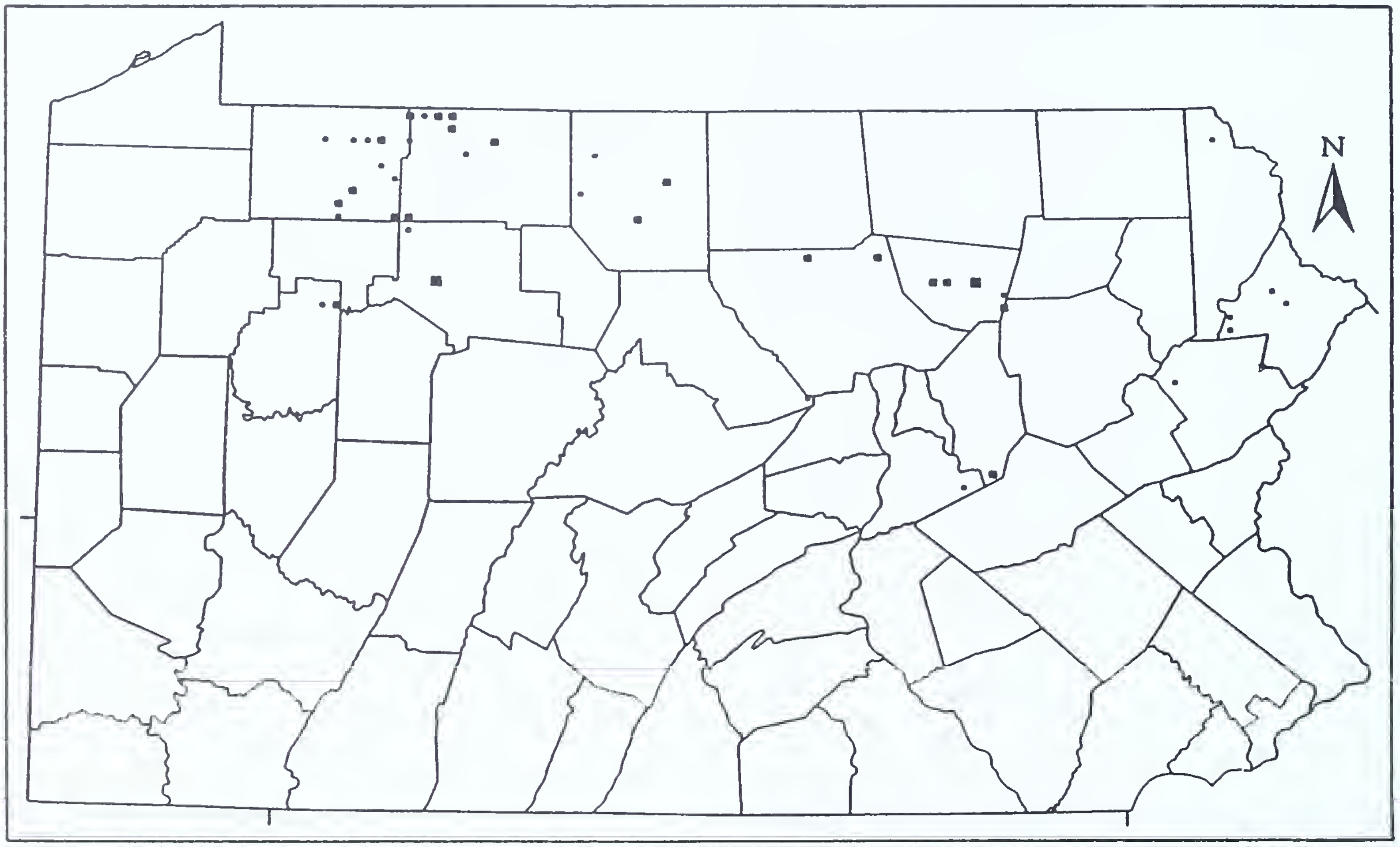
Source: *Brauning, Daniel - PA Breeding Bird Atlas*

### SWAINSON'S THRUSH

| | No. | % of Total | Priority Blocks |
|---|---|---|---|
| No. of Blocks in Which Recorded | 43 | <1 | 1 |
| ■ Possible | 22 | 51 | 46 |
| ■ Probable | 19 | 44 | 54 |
| ■ Confirmed | 2 | 5 | 0 |

Physiographic Regions in Which Recorded

| | No. | % of Region |
|---|---|---|
| Appalachian Plateau | 39 | 2 |
| Pittsburgh Plateau Section | 1 | <1 |
| Blue Ridge | 0 | 0 |
| Central Lowland | 0 | 0 |
| Coastal Plain | 0 | 0 |
| New England | 0 | 0 |
| Piedmont | 0 | 0 |
| Valley and Ridge | 3 | <1 |



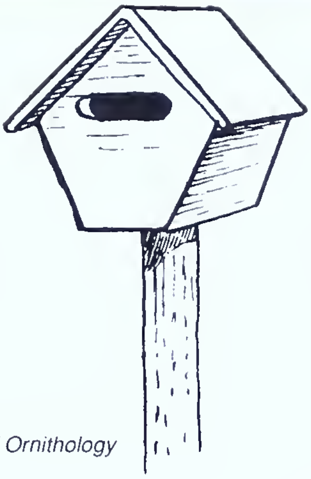
of the Allegheny Mountains of Somerset or Fayette counties. Individuals outside the basic population centers, near Mount Carmel, Northumberland County, and in Pike County, may represent unmated males; suitable habitat seems particularly limited in those areas.

The nesting season of the Swainson's Thrush is typical of neotropical migrants. Territories are established in May, with nests built by June. The only Atlas "confirmed" reports documented young in August.

With known breeding localities widely scattered across its potential range, the species' prospects seem favorable. However, the importance of conifers in its life cycle make the Swainson's Thrush vulnerable to deforestation on its breeding ground, and its use of mature forest on wintering areas in the tropics makes it particularly vulnerable to loss of that habitat.

—Daniel W. Brauning

Source: *Brauning, Daniel - PA Breeding Bird Atlas*



Cornell Laboratory of Ornithology

# Lesson 6

# *Nest Boxes*

## OBJECTIVES:

Students will explain the importance of nest boxes; and design and conduct a nest monitoring project.

## METHOD:

Students monitor nest boxes that they erect.

## MATERIALS:

Nest boxes or wood to make nest boxes, *Data Collection Sheet* (provided), nest box plans, bird reference books.

## BACKGROUND:

Many Pennsylvania songbirds are cavity-nesters, birds which make their nests in hollows of trees, snags or wooden fence posts. As land continues to be developed throughout the Commonwealth, nest sites for these birds are declining. Even with many homeowners and developers maintaining trees in new construction areas, the dead trees and snags that provide homes for cavity-nesters are usually removed for human safety. Nest boxes have proven to be an effective way people can provide sites for these cavity-nesters.

Nest boxes come in many different shapes and sizes, each designed to attract a particular species of bird. It is very important to learn about the species of bird desired, then build and place a nest box according to the needs of that species. There is often competition for nest boxes, especially from non-native, aggressive birds like starlings and house sparrows. The dimension of the entrance to the box can eliminate some of this competition. Some people remove the nests of starlings and sparrows from their boxes to allow them to be used by native species. This is a controversial issue and should be left up to the discretion of the teachers and students monitoring the boxes. Predators can also pose problems for birds nesting in these nest boxes. Raccoons, snakes, and house cats will all be attracted to the activity around a nest box. These problems can be

**Age:** Grades 4-12

**Subjects:** Math, science

**Skills:** Data collection, observation, summarizing, drawing conclusions, creating charts, identification

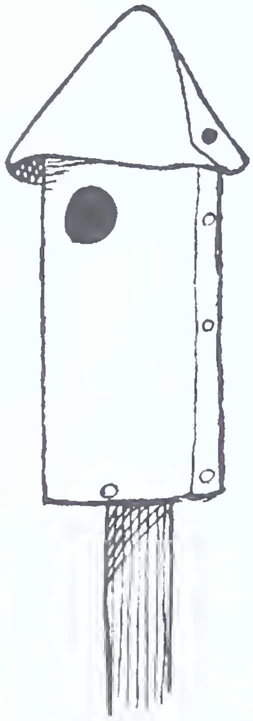
**Duration:** Breeding season

**Group size:** Variable

**Setting:** Indoors and outdoors

**Key vocabulary:** Cavity-nester, fledging

The nest within the box:
Bluebird: almost entirely of dry grasses, neatly arranged
House sparrow: weeds, grasses and straw, very messy, often fill up box
House wren: twigs
Tree swallow: grasses, and cup contains feathers.
Black-capped chickadee: grasses, twigs and moss



Cornell Laboratory of Ornithology

Small mammals such as squirrels, deer mice and white-footed mice will also nest in cavities. A mouse nest is made up of a variety of materials shaped into a ball.

reduced by selective placement of the boxes, restricting entrances to the minimal dimensions needed for the desired species, placing a predator guard on the post or box opening, or applying grease to the post every week. Plans for nest boxes can be found in *Woodworking for Wildlife,* available from the Pennsylvania Game Commission.

Thirty-five of the 185 species of birds breeding in Pennsylvania nest in cavities. More than half of these birds are songbirds. These birds live in a variety of habitats from forest to wetlands to fields. Probably the most famous cavity-nester in our state is the eastern bluebird. (Refer to Chapter 7, Lesson 2, for additional information on bluebirds.)

## PROCEDURE:

1. Students research songbirds in their area. Choose one or more species to attract using the nest boxes.
2. Build or otherwise obtain one or more nest boxes with the proper specifications for the chosen species.
3. Place boxes in the appropriate habitat and location. To make this more interesting, students can place several of the same type of boxes around your school. Collect information as to what species is using which boxes.
4. Once the box is in use, determine which species is making use of the box and continue monitoring the box at least once a week. If there are problems determining which species is using the box, the box may be opened to observe the eggs and the nesting material. (This should only be done after getting advice from local experts. Some birds are more aggressive than others, and boxes may also contain small mammals or reptiles, and some birds may be more sensitive to disturbance.) Record data on the species using the box, location of the box, and the dates the box is in use. Depending on the species being studied, data on the number of eggs laid and number of successful hatchings may also be recorded. This information is routinely collected for bluebirds.
5. Report findings to the school and send data to organizations and agencies working on cavity nesting projects.
6. All boxes should be cleaned after the breeding season and then again after winter. Many boxes are used during winter by birds, small mammals and insects.

## EXTENSIONS:

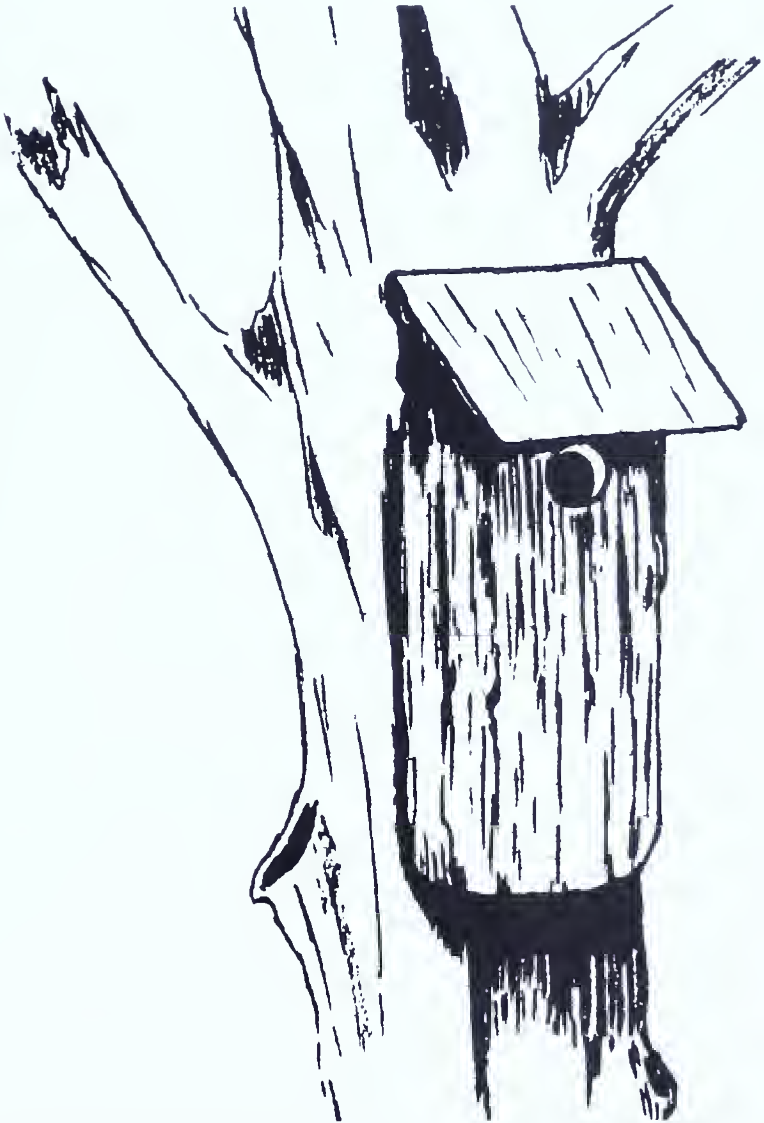
- Conduct nest project over several years and monitor use.
- Place identical boxes in different habitats to determine species use.
- Refer to Chapter 7, Lesson 2, for activity related to bluebird boxes.

## EVALUATION:

- Draw conclusions about the use of nest boxes based on data collected.

- Use data to explain and support the importance of nest boxes for particular species.
- Develop and conduct a presentation concerning the project to the school, community or interested organizations.

Developed by: T. Alberici, Pennsylvania Game Commission, Harrisburg, PA with ideas from "The Bluebird of Happiness" activities by Linda Zaletel, Rick Hollif, and Beth Brown. *Iowa Birds*. Iowa Ornithologist Union and Iowa Conservation Education Council, 1992.



*Cornell Laboratory of Ornithology*

## DATA COLLECTION SHEET

Date: ______________________ Name: ________________________________________________

Weather conditions: ______________________________________________________________

General location (school, street, etc.): _______________________________________________

County: _____________________________

Habitat description (if boxes are placed in different habitats, then list boxes and specific habitat):

_______________________________________________________________________________

_______________________________________________________________________________

| **BOX #** | **HABITAT** | **ACTIVITY LEVEL (active/ not active)** | **SPECIES** | **RESULTS (see codes below*)** | **REMARKS** |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

*Suggested Abbreviations for results:

E-eggs; YG-young (include # if known); YF-young fledged (include # if known);
YD-Young dead (include # if known); NP-nest predated.

# Lesson 7

# *How Many Birds?*

## OBJECTIVES:

Students will explain the importance of monitoring population numbers; and describe and implement one method used by scientists to estimate large numbers of organisms.

## METHOD:

Students construct and use a frame viewer to estimate the flock size of birds.

## MATERIALS:

6″ x 1″ cardboard strips (enough that each student or group can make a square frame viewer—four strips per viewer), masking tape, thread or string, glue, flock estimate slides (slides can be purchased through VIREO, Academy of Natural Sciences, 1900 Ben Franklin Parkway, Philadelphia, PA 19103-1195), slide projector, screen. (Note: For schools with low science budgets, pictures from nature magazines can be substituted for slides.)

## BACKGROUND:

By monitoring the number of birds, scientists can detect trends: Are populations increasing, decreasing, or staying the same? Based on population studies, scientists and wildlife managers can determine the status of a given population and take action (if necessary) to help that species.

Estimates of bird populations are the result of many observers spending hundreds of hours spotting, identifying, and counting birds. Population estimates can be done in many ways. The Point Count Method described in the beginning of this section is one type of count. Sometimes large numbers of birds are seen at one time. They may be of one species or many. Scientists may want to know how many birds use an area during migration or over winter. Counting all the birds can be difficult. One way to count the birds in a large flock is to photograph the flock and use the photograph to

**Age:** Grades 5-12

**Subject:** Math, science

**Skills:** Comparison and contrast, summarizing

**Duration:** One class period

**Group size:** Variable

**Setting:** Indoors

**Key vocabulary:** Flocking, roosting

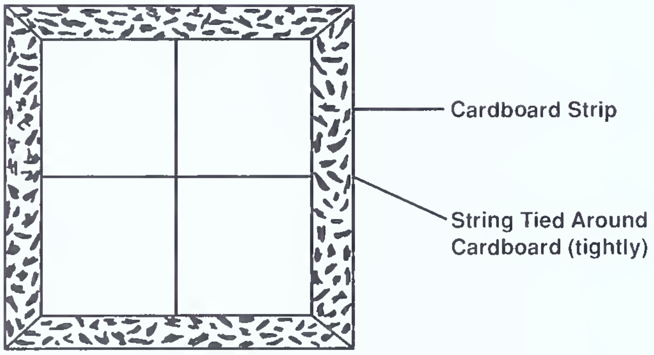
help determine the number of birds. This is done usually for shorebirds or seabirds, but can be applied to large flocks of songbirds as well.

Some birds are primarily solitary throughout the year. Others tend to stay in family groups or join other groups to form small flocks to migrate or over-winter. In Pennsylvania the largest flocks are the roosting assemblages of cowbirds, red-winged blackbirds, starlings and grackles.

## PROCEDURE:

1. Explain that the students are going to learn one field technique used by scientists to estimate the number of birds in a flock. Explain why scientists do this (see *Background* above). Obviously, it is very difficult to sit and count each bird in a flock, since many birds are moving at once. To estimate more accurately, students can use a frame viewer.
2. Have students look at a series of slides or pictures, viewing each for five to ten seconds, and estimate the number of birds in each slide without the viewer. (Make sure each student guesses and does not collaborate with others.) Ask them to write their results on a piece of paper.
3. Have each student construct a frame by attaching four 6″ x 1″ cardboard strips into a square, like a picture frame. Then, using string or thread, have students divide the square into four equal parts, like a window.

DIAGRAM:



Frame Viewer

4. Explain how scientists use a frame viewer to estimate the number of birds. The viewer is divided into quarters. They should look at the screen through one quarter of it, count the individual birds visible, multiply by four and record these results next to their first guess.
5. Ask students to compare their counts with and without the frame viewer.
6. Read them the correct number of birds for each slide. As a teacher, you will need to make an official count of each slide ahead of time. Ask them which techniques gave closer estimates. (Take class average.)
7. Notice any trends in estimating the number of birds. Typically, even experienced birdwatchers tend to estimate fewer small birds and more large birds than are actually present.

## EXTENSIONS:

- Use the viewer to estimate numbers of other things, e.g., flock of pigeons in the schoolyard, large patch of clover on the lawn, number of students on playground.

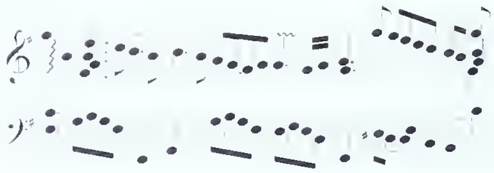
## EVALUATION:

- Students compare and contrast two methods of counting large flocks of birds.
- Students explain why scientists monitor populations and explain the problems associated with counting methods.
- Students develop their own method of counting individuals in a flock and compare accuracy with other methods.

Adapted with permission from:
Burton, Janis A. and Clendaniel, Dianne. *How Many Birds?* Manomet Center for Conservation and Science, Manomet, Massachusetts.

# Lesson 8

# *Bird Song Survey*



**Age:** Grades 9-12

**Subjects:** Mathematics, science (biology, zoology), language arts

**Skills:** Application, classification, comparison and contrast, description, discussion, mapping, media construction, observation

**Duration:** Minimum of three, 45-minute periods, not including transportation to bird inventory site

**Group size:** Up to 30, with need to break into smaller groups for bird watching

**Setting:** Indoors and outdoors

**Key vocabulary:** Inventory, population, habitat

## OBJECTIVES:

Students will identify and describe the importance of bird counting as one means of inventorying wildlife populations.

## METHOD:

Students investigate an area and use bird-counting techniques.

## MATERIALS:

Paper and pencil for note-taking, bird books as reference materials, drawing paper or magazine photos to illustrate final written project. (Optional: binoculars, tapes of bird-calls, and battery-operated tape player.)

## BACKGROUND:

People interested in wildlife and habitat use a variety of techniques to learn and to assist in management for conservation and protection. Some techniques are used to acquire information and some to apply knowledge. Inventorying is a technique that is used to acquire information about the number and variety of wildlife in a given area.

This activity is designed to give students some experience in the use of inventorying. The variety of species and the number of individual birds in an area are good indicators of the quality of that particular environment. Their presence indicates food, water, shelter and space in appropriate arrangement to suit their needs. "Bird-watching" can be a valuable research tool, as well as an aesthetically pleasing activity.

One means of identifying bird species is by sight, another by sound or song. Male birds of most species sing from conspicuous perches to mark territory, except during the nesting period. With practice, identification of many bird songs can be learned easily.

The major purpose of this activity is for students to recognize the importance of conducting an inventory as one technique by which to learn more about wildlife, people and our shared environments. The activity also enhances students' appreciation of aesthetic values associated with wildlife observation and conservation.

## PROCEDURE:

1. This can be an annual project, or a one-time project during a single school year. Offered each year for several years, the students who participate can contribute to a meaningful record of the natural history of their area.
2. Establish a suitable tract of land and an optimal season for conducting this activity. Check to find out what time of year the area provides the greatest variety and number of birds. (Local members of the National Audubon Society or a local bird club are often happy to assist.) Find an area that is most apt to offer a variety of habitats and thus a variety in birds as well. Transition areas between differing ecosystems like ponds, woods, and meadow areas are apt to be good locations. City sites with vegetation and water may also serve well. If students are assisting in identifying the most suitable site, remind them of the basic habitat needs of animals, food, water, shelter and space in appropriate arrangement. They can use these components as working criteria.
3. Invite a member or members of an Audubon chapter or local bird club to instruct the class on field study techniques for bird-watching. These people can help the class determine what bird species are common to the area, which are most easily identified, which are most difficult to spot, any precautions to take in order not to disturb the birds or other wildlife in the area to be studied, etc. As part of the students' preparation for guest speakers, ask them to bring in bird guides from home, school or local libraries or natural history museums.
4. Try to get recordings of bird songs of selected species. Practice identifying the birds by their songs.
5. Visit the site to apply the knowledge and skills the students have been working to acquire. Select a trail, path or road to walk in the area that has an easily discernible starting and ending point. If possible, the students should walk the trail in the early morning, using proper techniques in making and recording their observations. Members of the bird club, parents or other community members can come along to assist. Consider taking along the recorded tapes of bird songs with a battery-operated recorder. This reference "in the field" is a big help in identification.
6. Repeat the inventory one or more times that session to try to account for all breeding pairs. The number of singing males identified on each walk should be consistent.
7. Once back in class, have the students compile the results of their observations. Map the site and mark the locations of bird sightings, e.g., using colored dots for birds with an explanatory key. Encourage the students to discuss their observations as well as the feelings they experienced in the process of watching the birds. Also talk about any

difficulties they might have experienced in getting an accurate count.

8. As an option—a small group of students might volunteer to compile all the findings in a written format, including magazine photos or sketches of the birds. This booklet could serve as the beginning of a year-to-year record of the inventory of birds in that location at that time of year. As a new group of students repeats the inventory each year, the results could be graphed, showing any year-to-year changes. Additional information can be included in this report format, including a map of the area with the trail and other notable landmarks.

CAUTION:

***Do not disturb the birds. Take care not to disrupt mating, nest-building and nesting activities. Check with local authorities for precautions.***

## EXTENSIONS:

- In one school year, conduct several counts throughout the migration period, noting trends. Take counts seasonally, noticing similarities and differences.
- One or two singing male birds could be followed closely to determine the size of their respective territories. Be sure that students are following rather than chasing the bird. This could be a mapping and mathematics project, using geometry to calculate the area of the bird's territory. Map each location where the bird perches to sing his song and try to determine where he comes into conflict with a neighboring, singing male.
- Send for inventory techniques, counts, trends, and management implications for other species of animals from the Pennsylvania Game Commission. Make comparisons with class techniques and data.

## EVALUATION:

- Summarize the findings from your study. Why is it important to be able to inventory wildlife populations?
- Design a wildlife survey plan for conducting a butterfly census.

Reprinted with permission from:
Project WILD. *Project WILD K-12 Activity Guide.* Council for Environmental Education. © 1983, 1985, 1992.

## Lesson 9

# *Mini-Breeding Bird Atlas*

## OBJECTIVE:

Students will design and implement an inventory project.

## METHOD:

Students conduct a mini breeding-bird atlas in or around school grounds.

## MATERIALS:

Paper, markers, bird identification books, bird song tapes.

## BACKGROUND:

Ornithologists conduct large scale breeding-bird surveys in order to monitor changes in population and to determine management practices. Statewide atlas data can alert us to possible threats to bird species resulting from changing land use practices.

A statewide breeding-bird atlas was compiled in Pennsylvania during 1983-1989. The project was sponsored by the Academy of Natural Sciences of Philadelphia, the Carnegie Museum of Natural History, the Audubon Council of Pennsylvania, the Pennsylvania Game Commission and the Wild Resource Conservation Fund. The purpose of the project was to determine which birds bred in Pennsylvania and where. Compiling a breeding-bird atlas for the entire Commonwealth was a mammoth undertaking that required the cooperation and assistance of over 2,000 professional ornithologists and amateur birders.

The state was divided into breeding-bird atlas blocks. These blocks were based on the U.S. Geological Survey topographic maps covering 7.5 minutes of latitude and longitude, referred to as quadrangles. Each quadrangle was divided into six smaller blocks covering about ten square miles each. The state was then divided into atlas regions with a regional coordinator who was responsible for recruiting volunteers, assigning blocks, maintaining quality control, collecting the volunteer data and summarizing the data in a report to the project coordinator.

**Age:** Grades 4-12

**Subjects:** Social studies, science

**Skills:** Analysis, classification, comparison and contrast, discussion, generalizations, inference, mapping, observations, research, recording

**Duration:** Several class periods

**Group size:** Any

**Setting:** Outdoors

**Key vocabulary:** Inventory, monitor, breeding bird atlas

Atlas data was recorded on project field cards. These cards were then sent to the regional coordinator. The cards contained the name and number of the quadrant, the observer name and the data. Blocks were visited several times through the year so that the breeding time of all bird species was covered. Some volunteers visited their assigned blocks more than one year. In these situations, any additional breeding birds sighted were added to the atlas. The purpose was an initial survey of the breeding birds in Pennsylvania. This initial project was an example of an inventory. There is discussion of another atlas being conducted in 2000. Should this occur the project would then be a monitoring project.

Students can complete a mini breeding-bird atlas on their school site. Compiling a breeding-bird atlas draws upon many skills: identification, observation, counting, recording and mapping, for example. Also students can hone their talents as naturalists while learning about birds in their neighborhoods. Should this type of project be embarked upon, it may be helpful to contact local representatives from organizations or conservation agencies, such as National Audubon Society, Pennsylvania Game Commission and Pennsylvania Bureau of State Parks to help in identifying local birds and learning some common bird songs in the area.

## PROCEDURE:

1. Gather information as to the birds typically found in the area and the type of habitats they prefer. Learn to identify these birds by sight and sound.
2. Decide upon an area to be sampled for breeding birds. It can be the schoolyard, park, nature preserve or neighborhood block.
3. Have students prepare maps of the selected site. It may be preferable to have one overall large map and then break the area down into smaller blocks. (It would be helpful if the smaller blocks were mapped in a way that they could be reproduced on the data collection sheet.) Each smaller block then can be assigned a name, number or letter. This will make it easier for students to record their information accurately.
4. Create a data recording sheet. This should include a space to record the student's name, date, time, block name and weather conditions for each visit. The data collection sheet should also include a space to identify the bird, specific location and habitat and to check off the behavior it exhibits which may signify breeding. A data sheet may have the block map on one side and space for the other data below or next to it. If more than one bird is to be recorded on each sheet, students will have to come up with a system for doing so, e.g., a different symbol used on the map for each bird and a different space to record the behavior of each bird.

   Sample behavior observation:
   - *Observed on a nest, or carrying food or nesting material*—the bird is a confirmed nester;

  - *Observed as a pair, or singing, in a given area for more than one* week—the bird is a probable nester;
  - *Observed singing*—the bird is a possible nester.

5. Visit the site at least one time. Several visits within breeding seasons of different species of birds will give a more accurate atlas. Watch for birds engaged in one of the activities listed above to determine their breeding status. Try to identify and record the observations on your map and data collection card.
6. Return to class and start compiling the information. Record information on the large map and keep a running inventory of the observations. If inventorying the same site from year to year, consider this a monitoring program of the breeding birds in this area.

CAUTION:

***Please remember to observe nesting birds at a distance to avoid scaring the parents from the nest or alerting predators as to the nest site.***

## EXTENSIONS:

- Publish a mini breeding-bird atlas for the area.

## EVALUATION::

- Students can justify why they placed a particular bird in a breeding-bird status.
- Students explain why particular species are and are not breeding in their atlas area.

## RECOMMENDED LITERATURE:

Brauning, Daniel, ed. *Breeding Birds in Pennsylvania.* Pittsburgh: University of Pittsburgh Press, 1992.

Adapted with permission from:
National Audubon Society. *Audubon Adventures,* "Mini-Breeding Bird Atlas".

# Lesson 10

# Christmas Bird Count

**Age:** Grades 10-12

**Subjects:** Math, science, language arts

**Skills:** Analyzing, predicting, knowledge, communication, writing, identifying relationships, problem-solving

**Duration:** Several class periods

**Group size:** Any

**Setting:** Indoors

**Key vocabulary:** Census, Christmas Bird Count, citizen science

## OBJECTIVE:

Students will develop an understanding for interpreting data from a research project.

## METHOD:

Students interpret Christmas Bird Count data to look for trends in the populations of 13 species of birds.

## MATERIALS:

*Christmas Bird Count data sheets* (provided), graph paper, field guides.

## BACKGROUND:

The Christmas Bird Count is a coast-to-coast annual bird census conducted by volunteers. These volunteers count every bird and bird species seen and heard over one calendar day—from midnight to midnight. It is an example of what is now known as citizen science.

In 1900, ornithologist Frank Chapman was disturbed, as were many conservationists, at the slaughter of birds in the annual holiday event called the side hunt. The team that shot the most birds and other small mammals was the winner of the event. As a protest, Chapman organized 27 friends in 25 locations on Christmas Day 1900. Instead of shooting birds, they counted them.

Rules for the count are simple. Each count is a circle of 15 miles in diameter—approximately 177 square miles. Volunteers try to cover as much of the area as possible in a 24-hour time period, counting each individual bird and bird species seen. Over 45,000 people from all 50 states, Canada, the Caribbean, Central and South America and the Pacific Islands participate. A total of more than 1,650 counts occur during a two and one-half week period.

Birds, as an indicator of the health of our environment, can provide researchers with important information. Birds are the first group of animals to be affected by various environmental threats such as habitat loss and pollution. Christmas Bird Count data over time, in any given area, can provide valuable insight into the long-term health of bird populations and the environment.

## PROCEDURE:

1. Introduce the concept of a census to the students by assigning students to count the number of such things as students in the class, males/females in the class, students with blond hair, and so on. Place these numbers on the board, explaining that the students completed a census of the class—a count of a particular population. Explain that every ten years a census of the human population is completed. Ask why this might be done.
2. Ask the students if they can think of any other populations that could be censused *(birds, fish, other wildlife)*. For what reason would a census of wildlife be conducted?
3. Explain the history of the Christmas Bird Count. Explain that the students will be analyzing data from the Christmas Bird Count, just as researchers and demographers would analyze data from a human census.
4. Distribute the *Pennsylvania Christmas Counts* sheets. As a group, review the information provided, using the following questions to guide the discussion:
    - In what year were the most birds recorded? The least? The most species? The least?
    - In 1989, the most counts were conducted but the fewest number of birds recorded. Why do you think this might be? Were any fewer species seen than on other years?
    - Ask the students to compute the mean and median for the data for the number of species and the number of birds.
    - What year had the most counts but the second to lowest number of recorded species?
    - What factors might influence the number of species and total number of birds observed?
5. Divide the students into pairs, assigning each pair a species. The following is a background on each species. This information may be shared with the pairs, as a starting point for research.

**Snow goose:** This was a species that seldom was found in winter in Pennsylvania in former years. Just recently, large numbers started lingering on the lower Susquehanna River valley from fall into winter, and returning in early spring. The snow goose can be found in great quantities during spring migration at Middle Creek Wildlife Management Area in Lancaster County, Pennsylvania.

**Bald eagle:** The recovery of the bald eagle in the northeastern United States has been well-documented, but the number on the Christmas Bird Count provides clear evidence that the population is increasing.

**Wild turkey:** Since reintroduction efforts during the 1970s, the population of turkeys is climbing.

**Herring gull:** This is a species whose winter population is closely tied to the availability of open water and landfills. The dramatic variation in the numbers shows how widely the concentrations of a flocking species can vary with year-to-year conditions.

**Red-bellied woodpecker:** This is a southern species which has been gradually spreading north during the last 50 years. The spread of this species reflects a common trend in the northward advancement of a variety of southern species in the latter half of the 20th century. This has been interpreted in some circles as reflecting the effects of global warming. Whether global warming is occurring or not, the climate in the northeastern United States has clearly warmed dramatically in the past 50 years, and the advancement of southern species such as the red-bellied woodpecker, northern mockingbird, northern cardinal, and tufted titmouse, among others, has followed this trend.

**Carolina wren:** This is another species that is near the northern edge of its range in Pennsylvania. Its numbers have increased significantly over the course of the century, but it is a species that is very vulnerable to severe winters. It is non-migratory and can be affected by bad winters. The Christmas Bird Count data shows the trend of increasing populations during the 1980s, followed by a drastic decline following the severe winters of 1993-94 and 1994-95.

**Eastern bluebird:** This is a conservation success story, whose recovery is largely due to the widespread nest box programs that were started during the 1970s and 1980s.

**American tree sparrow:** This one is included as it is a subject of concern in recent years throughout the northeast. Many observers feel that there is a long-term, downward trend in this species. The Pennsylvania data does not reflect this, although concern has been expressed in recent bird publications.

**Brown-headed cowbird:** The numbers in the Christmas Bird Count show a declining population, although populations continue to increase in other areas. This might be reflective of the danger of relying on data taken from a limited area.

**House finch:** This species reflects the dangers of introducing exotic species. The house finch is native to the western United States, but was accidentally introduced in the eastern United States in New York after World War II. It is now one of the most common species in our region, although indications are that its numbers may have peaked and are starting to decrease.

**Evening grosbeak:** This interesting species is what ornithologists call an irruptive species in Pennsylvania. The main breeding populations are in western Canada, and they come south and east in years in which their Canadian food crops fail. As a result, their numbers can vary drastically from year to year, as shown in the Christmas Bird Count numbers. These numbers do not reflect changes in the population, just the variability in the migratory patterns of the species. This is an important concept for students to understand.

6. After assigning student pairs and a bird species, give each pair a copy of the *Total Number of Selected Species on Pennsylvania's Christmas Bird Count*. Explain to the students that they are now researchers with expertise in their bird species. They have been studying the trends of the species in Pennsylvania, and have been asked to do a presentation at the annual meeting of Pennsylvania Birdwatchers. Although this is a group of avid birdwatchers and feeders, they do not have the expertise of the researcher, and will need to know background information about each species. This background information will also enable the researcher to interpret the data properly.

Members of Pennsylvania Birdwatchers expect the following information:

- Name of species
- Wintering and breeding range (with maps—audiences love visuals)
- Feeding and nesting habits
- Preferred habitat
- Behavior patterns, such as flocking, colonial nesting, etc.
- Whether the species is a native, introduced (exotic), reintroduced (returned), transient or a species which has expanded its range
- If it is not a native, explain how or why it came to be found in Pennsylvania.
- Status of the winter population in Pennsylvania, including any trends. Any increases and decreases in population will need to be explained, as the audience is very concerned about bird populations and will want to know what is influencing them.
- Any threats to the species
- Prediction of future trends

Students should graph the data so that the audience will have a better understanding of the numbers.

7. When preparing their reports, students should be encouraged to investigate sudden drops and increases in population. Ask questions such as: "What kind of winter did we have that year?" or "Does this species flock? If so, how does that influence numbers?" or "These numbers (for the bluebird, for example) are showing a steady climb. Why is that?"
8. Researchers will share their reports with the class. They should be prepared to answer any questions that the audience might ask.
9. Discuss the benefits and drawbacks of this type of research.

## EXTENSION:

- Invite a Christmas Bird Count volunteer to speak to the class. Contact the Pennsylvania Office of National Audubon Society for a list of volunteers.
- Conduct your own census on school property or in a nearby neighborhood. Begin keeping data that can be compared over the years.

This is especially important when considering habitat improvement projects around the schoolyard.

- Arrange for the students to share their findings with others, either through presentation to the local Audubon chapter, bird club or other organization, or by publishing their papers for the school or local newspaper.
- Compare the graphs of each species. Do they show any trends? If birds are an indicator of the health of the environment, what conclusions can be drawn from the habitats needed by these species?

## EVALUATION:

- Students will present a paper that answers the questions put forth in the assignment. They will explain the trends in the data for their species.

*With special thanks to Bill Boyle for the Christmas Bird Count data, and Geoff LeBaron of National Audubon Society for the background information on the Christmas Bird Count.*

Developed by Marci Mowery, National Audubon Society, Pennsylvania Field Office.

## PENNSYLVANIA CHRISTMAS COUNTS AVERAGE NUMBER OF SPECIES, 1946-1995

| YEAR | AVERAGE | YEAR | AVERAGE |
|---|---|---|---|
| 1946 | 40 | 1971 | 57 |
| 1947 | 34 | 1972 | 57 |
| 1948 | 34 | 1973 | 63 |
| 1949 | 42 | 1974 | 64 |
| 1950 | 43 | 1975 | 67 |
| 1951 | 43 | 1976 | 64 |
| 1952 | 46 | 1977 | 65 |
| 1953 | 51 | 1978 | 65 |
| 1954 | 52 | 1979 | 65 |
| 1955 | 51 | 1980 | 63 |
| 1956 | 47 | 1981 | 63 |
| 1957 | 51 | 1982 | 63 |
| 1958 | 48 | 1983 | 65 |
| 1959 | 52 | 1984 | 64 |
| 1960 | 51 | 1985 | 66 |
| 1961 | 56 | 1986 | 64 |
| 1962 | 48 | 1987 | 63 |
| 1963 | 54 | 1988 | 61 |
| 1964 | 49 | 1989 | 63 |
| 1965 | 49 | 1990 | 64 |
| 1966 | 48 | 1991 | 66 |
| 1967 | 49 | 1992 | 65 |
| 1968 | 51 | 1993 | 64 |
| 1969 | 55 | 1994 | 66 |
| 1970 | 60 | 1995 | 67 |

## Pennsylvania Christmas Counts, 1983-1995

| YEAR | Number of Counts | Number of Participants | Total Number of Species | Total Number of Birds | Average No. of Species/Count | Average No. of Birds/Count | Average No. of Participants/ Count |
|---|---|---|---|---|---|---|---|
| 1983 | 52 | 1441 | 157 | 1,800,778 | 65 | 34,630 | 28 |
| 1984 | 54 | 1600 | 168 | 2,252,233 | 64 | 41,983 | 29 |
| 1985 | 55 | 1512 | 151 | 1,221,837 | 66 | 22,215 | 27 |
| 1986 | 55 | 1659 | 151 | 1,493,434 | 64 | 27,153 | 30 |
| 1987 | 57 | 1564 | 152 | 1,106,040 | 63 | 19,404 | 27 |
| 1988 | 57 | 1567 | 148 | 1,706,355 | 61 | 29,936 | 27 |
| 1989 | 60 | 1544 | 150 | 751,507 | 63 | 12,525 | 26 |
| 1990 | 57 | 1652 | 156 | 1,200,951 | 64 | 20,706 | 28 |
| 1991 | 60 | 1630 | 157 | 1,466,559 | 66 | 24,443 | 27 |
| 1992 | 62 | 1698 | 158 | 1,093,337 | 65 | 17,634 | 27 |
| 1993 | 62 | 1654 | 158 | 2,327,457 | 66 | 38,155 | 27 |
| 1994 | 62 | 1749 | 163 | 1,296,780 | 64 | 20,916 | 28 |
| 1995 | 64 | 1,765 | 149 | 1,063,183 | 67 | 16,612 | 28 |

## Total Numbers of Selected Species on Pennsylvania CBCs, 1983-1995

| Species | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Snow Goose | 52 | 44 | 79 | 117 | 206 | 49 | 41 | 705 | 705 | 951 | 37,618 | 72,205 | 32,421 |
| Bald Eagle | 16 | 10 | 18 | 16 | 8 | 34 | 37 | 29 | 45 | 44 | 52 | 49 | 62 |
| Wild Turkey | 130 | 68 | 311 | 120 | 255 | 316 | 440 | 347 | 894 | 715 | 1,242 | 1,599 | 3,424 |
| Herring Gull | 14,795 | 5,970 | 91,719 | 78,713 | 9,655 | 111,334 | 18,853 | 62,975 | 92,302 | 25,290 | 31,861 | 50,064 | 56,681 |
| Red-bellied Woodpecker | 1,086 | 1,169 | 1,451 | 1,578 | 1,496 | 1,765 | 2,037 | 1,303 | 2,332 | 2,249 | 2,767 | 2,432 | 3,290 |
| Carolina Wren | 670 | 1,273 | 927 | 1,408 | 1,609 | 1,768 | 1,800 | 2,609 | 3,634 | 4,356 | 3,029 | 1,218 | 1,295 |
| Eastern Bluebird | 1,043 | 1,473 | 1,720 | 2,284 | 2,093 | 2,941 | 2,539 | 3,138 | 4,534 | 4,966 | 4,356 | 5,257 | 5,238 |
| American Tree Sparrow | 7,241 | 4,997 | 10,551 | 6,401 | 4,807 | 6,263 | 11,219 | 6,615 | 6,840 | 6,164 | 8,458 | 7,157 | 11,029 |
| Brown-headed Cowbird | 122,199 | 438,030 | 16,562 | 54,546 | 11,001 | 11,491 | 2,765 | 10,254 | 9,707 | 3,983 | 12,271 | 5,712 | 6,469 |
| House Finch | 25,451 | 24,532 | 30,536 | 39,950 | 41,167 | 46,460 | 30,145 | 37,736 | 50,406 | 43,170 | 49,093 | 39,532 | 28,049 |
| Evening Grosbeak | 6,683 | 140 | 11,271 | 3,327 | 4,433 | 69 | 1,338 | 2,765 | 140 | 25 | 2,537 | 611 | 3,151 |

# Background

Birds are an integral part of our lives. They have provided food and clothing for humans, inspiration for songs, dance and art, have played a role in mythology, folklore and religion, provided millions of humans with enjoyment through watching and feeding, and play an important part in the delicate balance of life. Birds have been used to symbolize qualities and moods, the wise owl, the dove of peace and the bluebird of happiness.

Birds have appeared in myths throughout the ages. A classic myth is that of the phoenix. Well-known to Greek and Roman scholars, this myth can be traced to ancient Egypt. The phoenix, a bird of great beauty, lived for 500-600 years in the Arabian desert. It then burned itself to ashes, from which it emerged with renewed youth. Today, the phoenix symbolizes a new or emerging structure or idea.

According to Native Americans of the Pacific Northwest, the thunderbird, an eagle-like bird so large that thunder rolls from the movement of its wings, creates rain by spilling a lake it carries in the hollow of its back. The bald eagle is perhaps the most renowned of all birds. It appears in myths, songs and legends throughout the world, and is the symbol of the United States of America.

During 1991, almost three million Pennsylvania residents participated in observing wildlife, with over 3.5 million feeding birds. In a 1995 survey commissioned by the Wild Resource Conservation Fund, it was found that bird-feeding and bird-watching ranked second and fifth, respectively, on a list of 15 wildlife-related recreational activities. Nearly 49% of Pennsylvania residents feed birds.

Birds are a link in the web of life, without which we would be overrun by insects, rodents and other pests. A pair of warblers will remove caterpillars from over a million leaves in the ten days that they feed their young! Some birds, such as the hummingbird, aid pollination, while other birds play an important role in seed dispersal. Some birds, such as the crow and vulture remove dead carcasses, while other birds are prey for animals. Like the canary in the coal mine, birds are important indicators of the health of our environment. Historically, canaries were lowered into coal mines to detect odorless and colorless gases that could harm the miners.

Seven states chose the cardinal as their state bird, six chose the meadowlark, and five the mockingbird.

Several major-league sports teams have avian names and mascots, three of them songbirds: Baltimore Orioles, Phoenix Cardinals, and Toronto Blue Jays. The others are Atlanta Falcons, Atlanta Hawks, Baltimore Ravens, Philadelphia Eagles, Pittsburgh Penguins, and Seattle Seahawks.

The death of the canary indicated an unsafe environment. The decline in bald eagle and peregrine falcon populations was linked to the use of the deadly pesticide DDT.

When Christopher Columbus came to the New World, there were over three million passenger pigeons living in the American forests. Today, there are none. Of the 435 species that appeared in John James Audubon's *Birds of America,* four are extinct (nationwide), and 14 found in Pennsylvania are threatened with extirpation. (See Appendix for listing of species.)

On September 18, 1492, Columbus noticed flocks of sonbirds flying south. He changed course to follow the birds, probably golden plovers, making land on October 12, 1492.

Many life forms—birds, plants, animals—become extinct due to an inability to adapt to a changing environment. The changes may be natural (such as flooding or succession) or human-induced (such as habitat destruction). The accelerated pace at which changes occur today due to human impacts, however, has led to an unprecedented rate of species loss.

Historically, the natural resources of Pennsylvania or "Penn's Woods" have been both treasured and exploited. During settlement, forests fell to homes, farmland, and the logging industry. Remaining timber was converted into charcoal, a necessary ingredient for iron-making. The discovery of oil and coal led to mining activities, which produced miles of polluted streams. Waterways, once used for navigation, were dammed to produce electricity. Wetlands, nature's water purifier, disappeared—converted into agricultural fields, housing, and commercial development. With habitat loss came the loss of species, such as moose, bison, and the Bachman's and lark sparrows.

Today, Pennsylvania is home to more than 17 million acres of hardwood forests (70% of which are privately owned) 83,261 miles of rivers and streams, and 500,000 acres of wetlands. This network supports a diversity of wildlife, but the conversion of the natural landscape continues.

Each year, acres of bird habitat are transformed into parking lots, farm fields, buildings and roads to support the needs of an expanding human population. Activities that support these changes, such as the application of pesticides, road salts, and vehicular traffic destroy habitat components and/or take the lives of birds.

Historically, the collection of bird feathers, skins, beaks and feet led to decline in bird species. For example, at one time it was fashionable for ladies to adorn their hats with decorative bird plumes, wings, and at times, entire birds. The demand for this fashion brought about declines in numbers of several bird species. Two women—Harriet Hemenway and Minna Hall—decided that by discouraging the fashion and promoting legislation, they could effectively halt species decline. Today, the possession of any part of a non-game migratory bird species is against the law, although illegal trade does occur.

Starling

Introduction of exotic species, be they plant or animal species, leads to native species decline. One study revealed that 25% of an urban house cat's diet consisted of wildlife! Even introduced birds can become a problem. The introduction of starlings and house sparrows has led to competition with the native species for food and nesting areas. Changes in habitat have expanded the range of the brown-headed cowbird, a parasitic bird that lays its eggs in the nests of other species. The often larger baby cowbird out-competes its smaller "siblings" for food, leading to the demise of the host's offspring.

Human activity can also impact birds in other ways. Birds often fly into glass windows of large buildings and even residential homes. Birds are sucked into wind turbines and airplane engines, and are injured or killed in collisions with automobiles. Oil spills and chemical dumping have killed thousands of birds, particularly those living in or near water.

Rachel Carson, in her renowned *Silent Spring,* demonstrated the interconnectedness of all species—what impacts one species impacts all species. Humans are part of the total environment. Our survival, and the quality of life that we desire for ourselves and our children, is dependent upon how we choose to interact with the natural environment.

Folk wisdom holds that if you see a robin head for its nest, particularly if no eggs or young are present, batten down the hatches for a storm. The robin's nest, which they sometimes re-use from year to year, contains a large percentage of mud. It would be destroyed in a storm if not protected.

## Activity Suggestions:

Have students research birds in mythology, legends and stories. Collect and publish their research.

## Webbing:

To demonstrate our interconnectedness to the natural world around us, play the following game:

- Place students in a small circle. The leader stands near the edge with a ball of string and asks questions, such as, "Who can name a plant that grows in the area?" When a student answers, the student is given the end of the string. The teacher would then ask, "What animal eats this plant?," and passes along the string to the student who answers. Continue this line of questioning, connecting the students with the string as the relationship among the elements evolves. Bring in elements such as soil, water, sunlight, creating an ecosystem.
- To demonstrate the interconnectedness of all elements, remove one piece; for example, a wetland is drained for a shopping center. When the wetland steps away, others will feel a tug on the string. Ask those who felt the tug (those who depended on the wetland) to step away, and so on, until everyone has felt the impact of the loss of the wetland.

*See Bibliography for references.*

# Lesson 1

# *If There Were No Birds*

**Age:** Grades 6-12

**Subject:** Language arts

**Skills:** Writing, synthesizing, interviewing

**Duration:** 30 minutes first day, 20 minutes second day

**Group size:** Varied

**Setting:** Indoors and outdoors

**Key vocabulary:** Aesthetic, biosentinels

## OBJECTIVE:

Students will identify ways birds are beneficial and valuable to people and to the ecosystem they inhabit.

## METHOD:

Students complete a sentence posed by the instructor, then interview others to seek additional responses.

## MATERIALS:

Paper, pens or pencils.

## BACKGROUND:

Birds play an important role in food webs and ecosystem balance. Birds provide aesthetic enjoyment for people and function as indicators of the health of the environment. Birds have played a part in legends and lore for many centuries.

Birds fill more than one niche in the food web. Many birds, including most of the neotropical migratory birds, are insect-eaters, consuming large numbers of both adult and immature insects and other arthropods. These birds, in temperate regions of North America, contribute to keeping insect populations in check. For example, a breeding pair of warblers can remove caterpillars from over a million leaves in ten days. Herbivorous birds act as seed dispersers—ingesting seeds, carrying them great distances, and finally excreting them far from the host plant. Birds and/or their eggs may also provide food for other predators, avian and/or mammalian.

A bird's role in the food web is related to its function in maintaining ecosystem balance. All birds participate in nutrient cycling in their forest habitats. For example: a plant sprouts in nutrient-laden soil. Larval insects nourish themselves on the plant's tissues, and the insects are subsequently eaten by an ovenbird. The ovenbird becomes prey for a weasel, and the weasel returns the nutrients to the soil in its excrement.

Birds provide aesthetic enjoyment to many individuals. Identifying or watching birds is a hobby for a large number of people. There are others who enjoy bird-feeding at their homes or who appreciate listening to the chorus of birds.

Early coal miners took caged canaries into the mines with them—a dead canary would alert the miners to the presence of colorless and odorless lethal gas in time for them to escape. Similarly, wild birds provide an indication of the health of the environment. Declining bald eagle populations led to the discovery of dangerous levels of DDT in the eagle's food source. Researchers are using the bald eagle, osprey and common loon as biosentinels, monitoring their health for signs of pollution in the water and the fish they eat. A decline in suitable habitat for our songbirds is often followed by a decline in the number of birds. The information we receive from bird populations can instigate research into the reasons for changes in the environment and promote action to safeguard the environment for human well-being, too.

## PROCEDURE:

1. Break students into small work groups. Ask the groups to discuss ways to complete this sentence: "If there were no birds left in the world . . .." Compile information from each group to create a class list.
2. Explain that the students will be conducting interviews. Review interview skills. Remind students to accept in a non-judgmental manner whatever answer the respondent gives to the question. Remind students that interviews are a tool researchers use to find answers to questions posed. Role-play an interview. For homework, ask students to interview three people outside their class. For the interviews, they should ask each person to complete the same sentence as above. They are to write down the responses they receive. Stress interviewing a wide range of people: other students, neighbors, bus drivers, store clerks, family, etc. Encourage everyone to interview at least one retired person.
3. Have groups compile three to five other questions for the interview, such as: Do you put out bird feeders, birdhouses, or birdbaths? If so, why do you want to attract birds? Which is your favorite bird and why do you like that kind of bird? Do you like to watch birds? Why do you think bird populations are declining and what do you think we should do about it?
4. After the interviews have been conducted, discuss the interview process, and the most prominent responses. Add new answers to the class list envisioning a world without birds. Post this list in the classroom.
5. Discussion questions: What were the most frequent responses to the interview questions? What points were omitted? What other questions would you pose? Discuss how students view birds in relation to other

Grasshopper Sparrow

animals. Do they think birds, as a group, are more or less important to forests or to us than insects, reptiles, amphibians or mammals?

## EXTENSIONS:

- Categorize and graph interview responses.
- What if there were no birds, and therefore, no songbirds? Students may want to experiment using ear plugs on a walk to experience the silence. Have students write stories, poems or songs to describe a world without birds.
- Have students complete the same sentence from the point of view of a raccoon, an insect, or another species. How has the viewpoint changed?

As of March 31, 1998, there were 75 endangered species of birds in the United States, 15 threatened species, 109 proposed species, and 171 candidate wildlife species.

## EVALUATION:

- Evaluate students' completion of interview assignments.

## RECOMMENDED LITERATURE:

Carson, Rachel. *Silent Spring*. Boston: Houghton-Mifflin Co., 1962.
McDermott, Gerald. *Raven: Trickster, Tale from the Pacific Northwest.* New York: Scholastic, Inc., 1992.

Adapted with permission from:
Gilchrist, Susan, Row, Kadi and Borneman, David. *One Bird, Two Habitats.* Wisconsin Department of Natural Resources, 1993.

## Lesson 2

# *Lessons – From "The Lorax"*

**Age:** Adaptable

**Subject:** Science, language arts

**Skills:** Interpreting, application, knowledge

**Duration:** 45 minutes

**Group size:** Any

**Setting:** Indoors

**Key vocabulary:** Population growth, want, need

## OBJECTIVE:

Students will compare and contrast a fictional story to modern society.

## METHOD:

Students listen to story or watch video of *The Lorax,* by Dr. Seuss.

## MATERIALS:

Copy of book or video, *The Lorax.*

## BACKGROUND

Children's literature provides an effective tool for stimulating discussion of controversial topics. *The Lorax,* by Dr. Seuss (Random House, 1971) is the story of a woodland's destruction as economic demands lead to excessive use of natural resources and rapid population growth adds to environmental stress.

## PROCEDURE

First, read *The Lorax* to the class or watch the video. Then discuss the following questions as they relate to the story:

- Why did the Once-ler make so many thneeds?
- How were the animals and birds affected when the truffula trees were cut down?
- Why did so many more once-lers move into the area?
- How did the rapid population growth affect the environment?
- Although the words "Once-ler," "thneed," and "truffula trees" are fabricated words, they hold a deeper meaning. Explore with the students what message the author was attempting to portray in his creation and use of these words.
- Think about the imaginary land in *The Lorax,* as it was before the Once-ler arrived. Did it remind you of any real place you have seen? Now think about how it looked after the population

explosion changed the environment. Did it remind you of any real places you have seen?

- What could the Once-ler have done that would have allowed him to make thneeds without having such an impact on the environment?
- What could the Once-lers who moved there have done to maintain the natural environment?

## EXTENSION:

- Explore the impact of a local industry, either historical or contemporary, on the environment.
- Discuss the reason for environmental regulations. Assign students to research state and federal regulations that affect the environment, such as the Clean Water Act (federal), Dam Safety and Encroachment Act (state), Municipalities Planning Code (state), Clean Air Act (federal), the Endangered Species Act (federal) and the Migratory Bird Treaty Act (federal).
- Have students prepare an interpretation of other children's literature.
- Have students write a story in the style of Dr. Seuss, addressing a local environmental issue. Publish the collection of stories to share with the class.
- Discuss the difference between a want and a need.

## EVALUATION:

- Students will recognize the parallels between Dr. Seuss' make-believe world and habitat loss in Pennsylvania.

## RECOMMENDED LITERATURE:

Base, Graeme. *The Sign of the Seahorse*. New York: Henry N. Abrams, Inc., 1992.
Geisel, Theodore (Dr. Seuss). *The Lorax*. New York: Random House, 1971.

Adapted with permission from:
Counting on People: *Elementary Population & Environmental Activities,* Zero Population Growth, Inc., 1994.

# Lesson 3

# *Changes In The Land*

**Age:** Grades 6-12

**Subject:** Science, language arts, math, art, history, geography, social studies

**Skills:** Research, relationships, application, interpretation

**Duration:** Several class periods

**Group size:** 20-25

**Setting:** Indoors

**Key vocabulary:** Population, extirpated

## OBJECTIVE:

Students will recognize the role that human population has played in loss of songbird habitat.

## METHOD:

Students research how their local community and surrounding area has changed in the time since European settlement.

## MATERIALS:

Paper, pens, blank overhead sheets or transparencies for student overlay maps.

## BACKGROUND:

All species, including humans, need four things for survival—food, water, shelter, and space. Without these items, a species will perish, disrupting the delicate thread of interdependence of species.

From the time of the first census (1790) to 1990, Pennsylvania witnessed a population increase of 27 times. In 1998 there were approximately 12 million Pennsylvanians. In land mass, Pennsylvania ranks thirty-third in the nation, covering 29 million acres. In terms of population, only four other states have a population larger than Pennsylvania. One-third of Pennsylvania's twelve million residents (most of whom were born in the state) reside in rural areas, representing the largest non-urban population in the nation.

Pennsylvania has long been noted for the quality of its rural life. In fact, Pennsylvanians are noted for being life-long residents of the state. This quality of life could be the downfall of the state, as residents from surrounding metropolitan areas relocate or purchase second homes in rural Pennsylvania. Twenty-seven of Pennsylvania's 67 counties are expected to grow at a rate of more than 10.1% by the year 2000. An additional ten counties are expected to grow between 5.1-10%. Counties witnessing a

As the human population increases, wildlife populations decrease because people use the space once inhabited by wildlife.

decline in population tend to be the more metropolitan areas, as residents continue to flee the city for rural life.

Pennsylvania is home to more than 17 million acres of hardwood forests (70% of which are privately owned): 45,000 miles of rivers and streams, and 500,000 acres of wetlands. The demands of a growing and shifting human population on these resources could undermine their existence.

## PROCEDURE:

1. Divide the class into four groups—1700s, 1800s, 1900-1949, 1950-present. Each group will be asked to research their assigned era. Depending on the level of student, this could be a local assignment, such as the community or county, or the students could be asked to research the state.
2. Assign the students the following questions:
   - Who resided in (municipality, county, or state) during your era? What was the total human population? Describe the people that settled this area. Why do you think they chose this area/state to settle? Describe the way of life of these people. Graph the various ethnic groups by type and population over time. Interpret the graph. Draw a map supporting your graph.
   - What were the industries of your era? What natural resources were needed to support the industries? What were the by-products or wastes of the industries? Are any of the types of industries still active today? If so, how have they changed? If not, what caused their demise? Graph the industries and resources used. What resource was used the most? How did the by-products impact the quality of life for birds and humans? Develop maps showing your findings.
   - Describe the natural resources of your era. How many acres of wetland, forest, and grassland were present? What was the quality and quantity of surface water? Did any species become extinct or extirpated (no longer present in Pennsylvania, but existing elsewhere, such as wolves and bison) during your era? If so, what were the species and what were the causes leading to extinction or extirpation? What were the threats to the natural resources? Was any movement made to protect natural resources during your era, such as establishment of a park, passage of legislation, etc.? Describe the methods used to protect the resources. Were they effective? Why or why not? Develop maps and graphs to demonstrate your findings.
   - Describe the communities of your era. How were they planned and designed? What methods of transportation were utilized? What fuels were needed to power the transportation and provide heat for homes and cooking? What forms of recreation were popular? Did

**What can you do?**

**1.** Provide wildlife habitat.

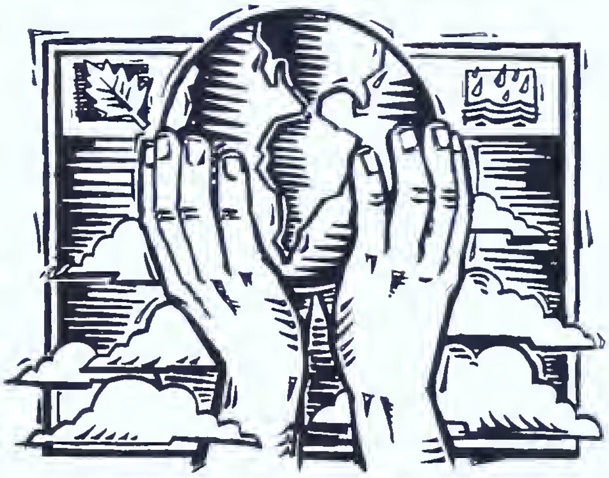
**2.** Leave wildlife in the woods Sometimes we come across an animal that we believe was abandoned by its mother. Chances are, the mother is nearby and will be back soon after you leave. Wildlife has a much better chance at survival if they are taken care of in the wild by their own kind.

**3.** Learn more about the links between population growth and the environment in order to further educate yourself and others.

children attend school? Why or why not? Draw a map or create a diorama of a typical community or home during your era.

- What was the status of bird populations during your era? What were the threats to bird survival? Locate on a map important bird habitat sites during your era or places that might have provided important bird habitat during that era. Graph changing bird populations (National Audubon Society Christmas Bird Count data has been collected since the early part of the 20th century.)

3. Students can utilize various methods of research to support the project, including interviewing historians and local/state people and organizations, literature search, Internet search, review of historic documents and maps. If interviewing, have students develop a series of questions that all groups use, so that information is more streamlined and easy to use. A visit to a local retirement community would not only provide the students with knowledgeable people to interview, but would be a pleasure to the residents as well!
4. Students should prepare their research so that it can be presented and shared with the class. Photocopy all maps onto clear plastic (overhead projector sheets) to use as overlays. (For example, when the 1900 population map showing concentrations of people is overlaid on the 1700 forest map, students can see that habitat was lost to create room for the new communities.) Compare graphs and charts.
5. Use the reports to begin a class discussion regarding changes (in all areas). How have these changes benefited humans? Wildlife? Birds? How have they caused harm to humans? Wildlife? Birds? Is change good or bad? Support your answer. What changes can you remember during your lifetime? Has the pace of change remained constant, accelerated or decreased? What does this mean for humans and wildlife?



## EXTENSIONS:

- Prepare a presentation of findings to the local history, garden or civic club.
- Compile all graphs into a master graph, complete with interpretation.
- Visit a local historic or natural site as a class trip.
- Sponsor a "history" day in which the students are transported back to a predetermined era for one day. Students and faculty could dress in period clothing, prepare foods from that era, develop a newspaper reflecting the happenings of that era, etc.
- Read books by or about state leaders in the environmental movement. See literature recommendations.

## EVALUATION:

- Students will compare and contrast various eras and participate in discussion.

## RECOMMENDED LITERATURE:

Bonta, Marcia. *Women in the Field.* College Station: A&M University Press, 1991.
Caduto, Michael & Bruchac, Joseph. *Keeper of the Earth: Native American Stories and Environmental Activities for Children.* Fulcrum, Inc., 1989
Jeffers, Susan. *Brother Eagle, Sister Sky.* New York: Dial Books, 1991.
Silverstein, Shel. *The Giving Tree.* Harper Collins Publishers, 1964.
Stranahan, Susan. *Susquehanna: River of Dreams.* Baltimore: Johns Hopkins University Press, 1993.
Yolen, Jane. *Encounter.* New York: Harcourt Brace Jovanovich, 1992.

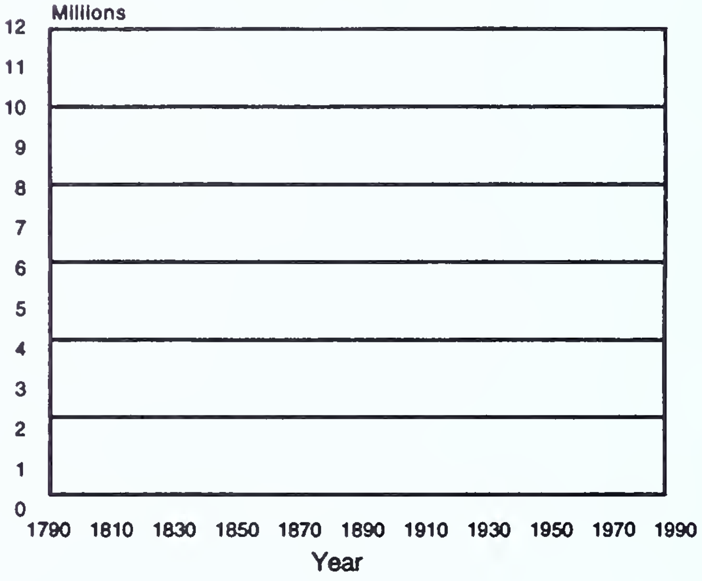
Developed by Marci Mowery, National Audubon Society, Pennsylvania Field Office.

### *How many people are there?*

Use the following data to construct a chart showing population growth in the state of Pennsylvania since 1790. When has the most growth taken place?

| *Year* | *Number* |
|---|---|
| 1790 | 430,000 |
| 1810 | 810,000 |
| 1830 | 1,350,000 |
| 1850 | 2,300,000 |
| 1870 | 3,520,000 |
| 1890 | 5,260,000 |
| 1910 | 7,670,000 |
| 1930 | 9,630,000 |
| 1950 | 10,500,000 |
| 1970 | 11,800,000 |
| 1990 | 11,900,000 |

**World Population**



## Lesson 4

# *Deciding Environmental Issues*

## OBJECTIVES:

Students will examine their own values and beliefs related to wildlife and other elements of society; respect the right of others to maintain different values and beliefs; and evaluate actions that might impact the environment.

## METHOD:

Students read, discuss, make judgments and write hypothetical dilemmas concerning wildlife and/or natural resources.

## MATERIALS:

*Dilemma Cards* (provided).

## BACKGROUND:

This activity is designed to give students the opportunity to examine their own values and beliefs as they relate to wildlife and other elements of the environment. It is not the intent of this activity to prescribe "right" and "wrong" answers for the students. One exception is in the areas where information about laws is conveyed.

The Pennsylvania Game Commission is responsible for caring for the wildlife within Pennsylvania. Contact the Commission to learn more about the specific laws in the state that have been established to protect our wildlife.

There are also federal regulations that affect wildlife. The U.S. Fish and Wildlife Service is responsible for overseeing these laws. In Pennsylvania, their office is located in State College. (Refer to the Appendix for address and telephone number for both wildlife agencies). All migratory, a general term which includes most birds species, birds are protected by federal regulations. That means it is illegal to intentionally harm these birds (except during regulated hunting season). It is also illegal to possess birds' eggs, feathers and nests, even those found on the ground. It is generally illegal to

**Age:** Grades 5-12

**Subjects:** Social studies, science, language arts

**Skills:** Analysis, application, discussion, evaluation, problem-solving, small group work, synthesis, writing

**Duration:** 30- 45 minutes

**Group size:** Any

**Setting:** Indoors or outdoors

**Key vocabulary:** Dilemma, responsibility take home injured wildlife for rehabilitation. Wildlife rehabilitators possess a permit that allows them to do so.

Whether right or wrong, questions of law can be separated from questions of ethics. At a personal level, an individual's choices as to what seem right or wrong for him or her in terms of values and behaviors may be described as a personal code of ethics.

It is the major purpose of this activity to provide students with an opportunity to come to their own judgment about what they think are the most responsible and appropriate actions to take in situations affecting wildlife and the environment.

The first recorded collision between a bird and an airplane came in 1910, when a pilot flying a plane at Long Beach, California collided with a gull.

## PROCEDURE:

1. From the attached pages, the teacher should copy and cut the *Dilemma Cards*. Other dilemmas could be written that are more specific to local problems or concerns. Students could also be involved in the process of writing dilemma cards.
2. Divide the class into groups of four, and give each group a stack of *Dilemma Cards,* facedown in the center of the group.
3. The first student draws a card from the top of the stack. The student studies the situation, decides what he or she should do, and formulates his or her reasoning.
4. When the student is ready, the student reads the situation and the options aloud to the rest of the group. The student gives the decision that he or she has chosen, and the rationale for doing so. In turn, each of the members of the group is invited to comment on the dilemma. The person whose dilemma is being discussed should have the opportunity to ask questions of the other members of the group and to offer clarification about his/her decision. The discussion (which should take about five minutes) gives the students experience in having ideas examined by peers and is intended to remind students to take a personal responsibility for decision-making. It is not necessary for the students to reach consensus.
5. The card is then returned to the bottom of the stack and the next student repeats the process.

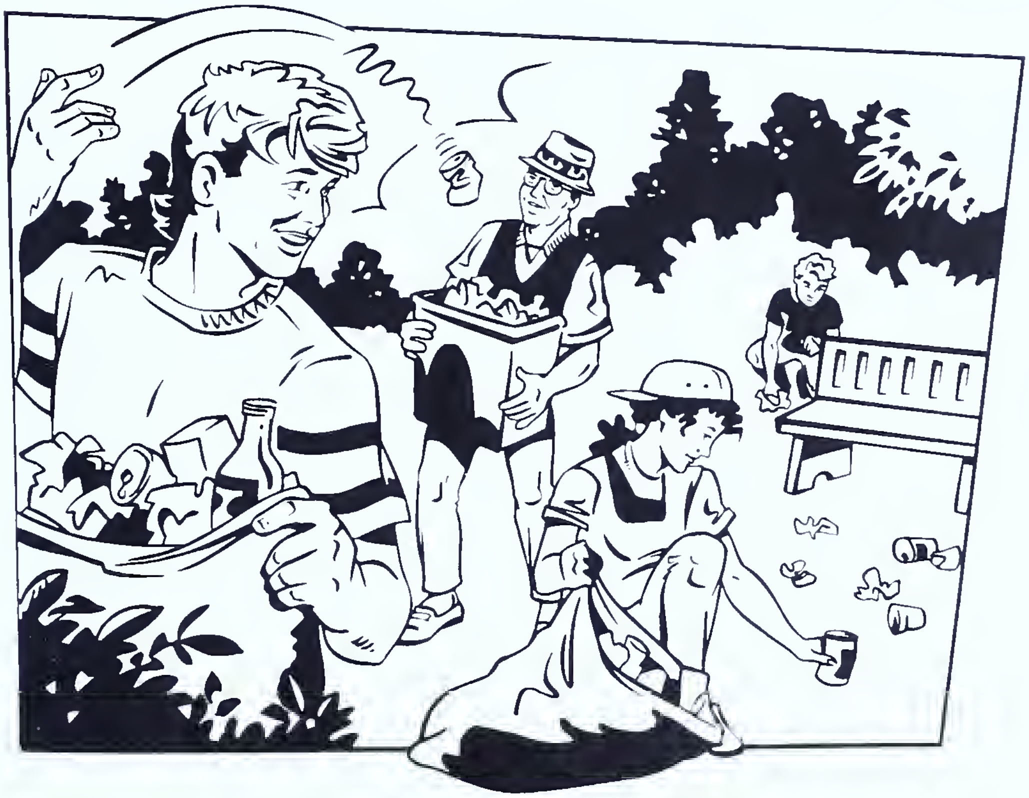
## EXTENSIONS:

- Adapt the lesson to a debate format.
- Have students write and discuss their own dilemmas.

## EVALUATION:

- Choose a dilemma. Write a paragraph on the positive and negative effects of all the options listed for the dilemma. Indicate what additional information, if any, is needed in order to make a responsible and informed decision. Give two opposing and convincing arguments for how to respond to the dilemma. Identify what you expect to be the most responsible decision; explain your reasoning. Explain how someone else could reach a different, yet valid, opinion with the same information.

Adapted with permission from:
Project WILD. *Project WILD K-12 Activity Guide,* "Ethi-Reasoning." Council for Environmental Education. © 1983, 1985, 1992.



## DILEMMA CARDS

### Decision Situation # 1

One Saturday, you are out exploring your favorite pond. You are working on a science project, and you are hoping to see birds, bird tracks, and bird nests. When you find an empty nest in the branches of a shrub, do you:

- Take the nest out of the shrub, examine it carefully, sketch it, and then put it back in the branches of the shrub.
- Take the nest with you to show the class.
- Make a sketch of the nest without touching or removing it.
- Other (explain).

*Note: After making your decision, find out which of these options are against the law.*

### Decision Situation #2

One spring day, you discover a young bird in your backyard. The bird is sitting on the ground, calling loudly. When you approach the bird, it tries to fly away but it is only able to flutter a few inches above the ground. After inspecting the area carefully, you find no signs of a parent bird. You do see, however, your neighbors' cat asleep on their patio. In response to the situation, do you decide to:

- Leave the young bird where it is.
- Pick up the young bird and put it in the bushes.
- Take the young bird inside so you can feed it until it is able to fly.
- Take the young bird to an animal shelter.
- Other (explain).

*Note: After making your decision, find out which of these options are against the law.*

### Decision Situation #3

You and your family have been operating a feeding station for birds during the winter for many years. Usually, the birds start feeding at your station in early November and continue to do so until spring. This particular winter, you and your family are going on a two-week vacation during January. In regard to the operation of your feeding station while you are gone, do you:

- Let the birds fend for themselves.
- Put out a two-week supply of seed and suet.
- Make arrangements with a neighbor to have fresh bird food put out daily.
- Other (explain).

## DILEMMA CARDS (continued)

**Decision Situation #4**

A week or so ago, you put up a nesting box for bluebirds in your backyard. You have seen bluebirds in the area, and you know that a shortage of nesting cavities in trees (which have been cleared) and wooden fence posts (which have been replaced by metal fence posts) exists. You also know that bluebirds are forced out of natural nesting cavities by more aggressive starlings and house sparrows. These two species were unwisely introduced into the United States from Europe. These feisty birds are quick to fight, and will often drive a bluebird away from the cavity nest.

When you see a pair of starlings carrying nesting materials (twigs and leaves) into your new bluebird box, do you:

- Open up the bluebird box every day and take out the twigs and leaves until the starlings give up and abandon the box.
- Shoot the starlings with a BB gun.
- Do nothing, and hope the starlings will not return next year.
- Build and put up another bluebird box.
- Other or a combination (explain).

**Decision Situation #5**

You and your friend are playing catch in the backyard. After you have grown bored with your game, your friend challenges you to a new sport. When you ask what the sport is, your friend says you can both shoot birds with a BB gun. Your friend has already bagged several robins, a cardinal and a blue jay.

After your friend has gotten the gun and is ready to start, do you:

- Watch your friend, but say that you do not want to shoot;
- Try your skill at shooting;
- Watch your friend, but later tell his/her parents;
- Say that you do not want to shoot, and that you do not think that your friend should shoot either.
- Other (explain).

*Note: After making your decision, find out what the laws are in your area for owning and shooting a BB gun.*

## DILEMMA CARDS (continued)

### Decision Situation #6

You have just graduated from high school and are attending a graduation party at Lake Erie. Several of your friends are racing beach buggies along the shore through the dunes. It looks like fun, and you think you might like to take a try. However, one of your other friends has just told you that there are nesting birds in the area. Common terns, ring-billed gulls and piping plovers have been spotted in the flat stretches between the dunes. These birds, who nest in colonies on the ground, have speckled eggs and lightly-colored chicks that are well camouflaged against the sand.

When you are offered the wheel of a buggy, do you:

- Hop in and chase after your friends.
- Hop in and try to steer away from the nesting area.
- Say "no, thank you" and suggest to your friends that they stop driving along the shore and through dunes.
- Other (explain).

### Decision Situation #7

Your family decides to put in a vegetable garden. You follow the planting directions carefully, and are rewarded with a medley of tomatoes, peppers, broccoli, and other vegetables. Then one day you notice that some of the vegetables are being eaten by insects.

You have also noticed some insect-eating birds, such as the bluebird, during the hours you spent in the garden. You know that if you apply pesticides, the bluebirds could ingest the pesticides through the insects that they eat. But you also know that you need to protect your garden. Do you:

- Apply pesticides, following the manufacturers' directions.
- Apply pesticides, doubling the application so that you can quickly eliminate the insects.
- Decide you could afford to lose a few vegetables.
- Look for alternative methods of pest control.
- Other (explain).

### Decision Situation #8

You are walking down the street and you see a family. One of the children throws a piece of candy on the ground. Do you:

- Pretend you didn't see.
- Pick it up and put it in the trash.
- Explain to the family that wildlife could think the candy was food and eat it, causing the animal to be ill.
- Other (explain).

## DILEMMA CARDS (continued)

### Decision Situation #9

You are walking down the street when you see a man selling beautiful birds at a very inexpensive price. You have learned that some birds are smuggled into the country and sold illegally. Do you:

- Ask him where the birds were raised.
- Report him to the proper authorities.
- Buy a bird and enjoy your new pet.
- Other (explain).

### Decision Situation #10

A wildlife biologist came to your school recently to talk to your class about birds. The biologist told you that quite a few of the birds that summer in North America's woodlands migrate to the tropical rain forests of Central America for the winter. The biologists and other experts are terribly concerned about the well-being of these birds because their winter habitat in Central America is being destroyed at an alarming rate. Forty percent of the tropical rain forest could be gone within just ten years.

The wildlife biologist explained that much of the rain forest is being cleared to make room for pastureland for cattle grazing. These cattle are slaughtered and the beef is sold to fast food companies in the United States. Since fast food businesses are booming, the demand for this inexpensive beef is also booming. The pressure on the rain forest is great.

The wildlife biologist concluded the talk by asking if there was anything that you and your friends could do to help save the rain forest. You have given the matter much thought and have decided:

- That there is nothing one person can do, and that the Central American countries will have to save their forests.
- That you can help by not buying hamburgers at fast food restaurants that practice rain forest grazing.
- That you can help by writing to your elected officials, asking them to help through habitat preservation programs.
- Other (explain).

### Decision Situation #11

A northern mockingbird has a nest in a bush along a busy sidewalk and is attacking all who walk by. What would you do?

- Remove the nest.
- Harass the bird.
- Post a sign to alert people to cross the street.
- Other (explain).

## DILEMMA CARDS (continued)

---

**Decision Situation #12**

The local Audubon Society has permission to reintroduce peregrine falcons (an endangered species) in the city in which you live. You know that the falcons eat pigeons, which you feed every day. What do you do?

- Organize a protest to the reintroduction. After all, if they were meant to survive, they can do it without human help.
- Devise a way to eliminate the bird once it is reintroduced.
- Decide that there are enough pigeons for both the falcon and for you to feed.
- Other (explain).

---

**Decision Situation #13**

A killdeer is nesting on your apartment roof (or in your driveway) and is preventing you from sunbathing (or using your driveway). What do you do?

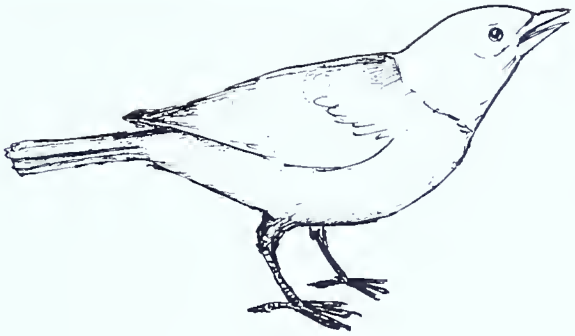
- Destroy the nest in hopes that the bird will find a different site.
- Relocate the nest.
- Leave the nest and sunbathe on a friend's roof (or park your car on the street).
- Other (explain).

---

**Decision Situation #14**

The town park is extremely overpopulated with mallard ducks and Canada geese, which gather to be fed by well-meaning folks. The park grounds are saturated with the droppings of these birds. What do you do?

- Suggest that the town hold a controlled hunt of these birds.
- Poison the birds.
- Explain to people that bread is not part of the birds' diet, and that if feeding were curtailed the birds would be encouraged to relocate.
- Other (explain).



# Lesson 5

# Cowbird Capers

## OBJECTIVES:

Students will recognize that forest fragmentation increases "edge effects" including brood parasitism; recognize that brood parasitism affects the reproductive success of forest songbirds; and describe how nests of breeding songbirds are parasitized by brown-headed cowbirds.

## METHOD:

Students participate in a simulation of cowbird parasitism.

## MATERIALS:

Songbird and cowbird "beaks" made by the students, blindfold, four small paper or plastic cups, one large unbreakable mixing bowl or plastic container, five three-foot long pieces of string, popped popcorn.

## BACKGROUND:

Breaking a forest into fragments (forest fragmentation) reduces the total number of suitable territories, and hence nesting sites, for those birds that depend on interior forest. Fragmentation contributes to the decline of migratory bird populations by giving parasitic birds access to their hosts, a phenomenon referred to as "brood parasitism."

Brood parasites are birds that lay their eggs in the nest of other birds (host species). The parasites' eggs hatch and are raised by the host species. Some parasites never rear their own young and are totally dependent on the host species. The brown-headed cowbird (Molothrus ater) is the most common nest parasite in North America.

Because the host parent birds are attending to the parasite young, often few or none of the host's own young survive. Young cowbirds tend to hatch and develop more quickly than most songbirds. Often they are bigger too, and they may push the others out of the nest. Many of the host species that evolved with the brood parasites have reduced the success of parasites through a variety of methods, such as building a new nest or pushing the parasite eggs out of the nest. However, if a host species has not co-evolved

**Age:** Grades 4-8

**Subjects:** Science

**Skills:** Analysis, discussion, problem-solving

**Duration:** 20-30 minutes

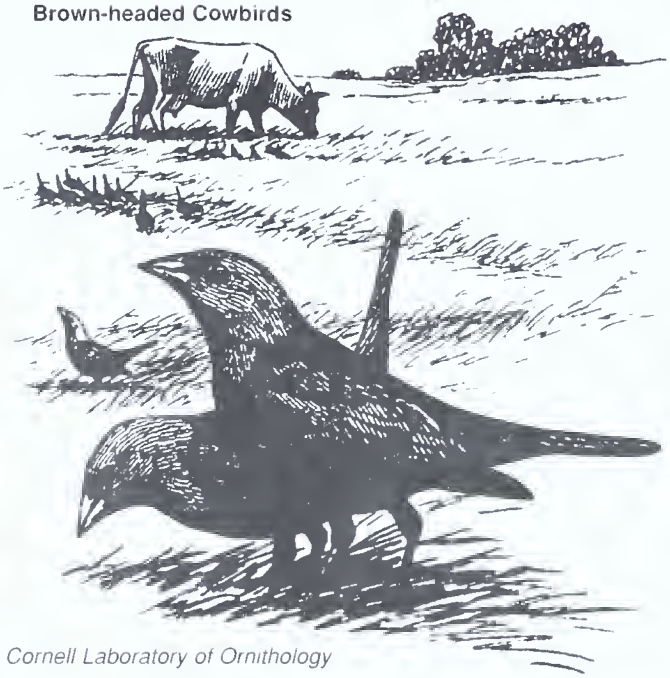
**Group size:** Adaptable

**Setting:** Indoors or outdoors

**Key vocabulary:** Cowbird, brood parasitism, fragmentation with a parasitic species, the host may lack strategies to cope with parasitism. This is the case in North America, where the cowbird can now reach populations of forest songbirds.*

Prior to European settlement, the brown-headed cowbird was found in the western part of our country. Its habitat was open grassland. It followed the buffalo, eating insects from their dung and from the prairie disturbed by their great hooves. Because it followed the herd to find food, it could not warm and hatch its own eggs and raise its young, so cowbirds adapted by using the nests and parenting abilities of other birds. With settlement and subsequent deforestation of large portions of eastern North America, the range of the cowbird has expanded. The forest fragments contain more area that is adjacent to forest edge, and cowbirds now have increased access to forest bird nests.

Brown-headed Cowbirds



Cornell Laboratory of Ornithology

Cowbird populations have also increased due to an increase in rice cultivation in the south. Rice provides a previously lacking winter food source. Increased cowbird populations, in combination with increased forest fragmentation and edge effects, have led to increased brood parasitism.

Many forest-dwelling migratory birds have not developed defenses to parasitism. The susceptible host birds include warblers, vireos, flycatchers, tanagers and thrushes. If cowbird populations continue to rise, the populations of our forest-dwelling migratory birds are likely to continue to decline.

Cowbirds earned their common name from the habit of following herds of buffalo (and cattle) in search of insects that were flushed up by the large grazing mammals.

## PROCEDURE:

1. Thread each of the cups onto a three-foot string by punching two small holes on opposite sides near the bottom of the cup.
2. Secretly select a student with a loud voice to be the baby cowbird. Tell the cowbird to join others in the circle when you give the signal. Explain the activity to the selected student, but keep the cowbird's role a secret from the rest of the class.
3. Introduce the lesson by asking why songbird populations are declining or what effect cutting large tracts of forest into small fragments has on forest songbirds. Say, "Let's simulate a songbird nest to find out."
4. Select four students to be baby songbirds. Have them sit facing outward in a tight circle. Tie the plastic cups onto the heads of the four baby songbirds, like hats, with the open end pointing up. Explain that the cups represent the open mouths of baby birds. When the parent birds returns to the nest, the baby birds call loudly, "Tweet, tweet,

---

*The negative impact of cowbirds is more a Midwestern phenomenon. Parasitism rates in eastern Pennsylvania woodlots are reported in one study at only 4%. In central Pennsylvania, 150 nests in forest openings were surveyed and only one cowbird egg was found. However, access to short grass, greater fragmentation, and access to feeders can make the cowbird problem locally worse.

tweet," to signal to the parent that they are hungry. The parent bird responds by distributing food to the hungry babies. Typically, the loudest bird attracts the most attention.

5. Select one student to be the parent bird. Give that student a blindfold and a bowl of popcorn. The parent bird distributes food (popcorn) to the hungry baby birds by standing at the edge of their circle and dropping or tossing pieces of popcorn in the direction of the tweeting birds. Blindfold the parent bird to be sure s/he is distributing food only in response to whomever is tweeting loudest. Each baby bird must catch at least ten pieces of popcorn in the cup to survive. Caution students that they should not push or shove—rather they should tweet louder to catch the parent's attention.
6. After the directions are given and the parent bird is blindfolded, the baby cowbird is signaled to quietly enter the nest and sit in the center of the baby birds. Don't let the parent know this is happening. The baby cowbird competes for food and is aided by the larger container (mixing bowl), which is held on top of his/her head to represent the large gaping mouth of a cowbird. The baby cowbird should join the other baby birds in tweeting loudly for food. The cowbird's larger "mouth," louder voice and central location in the nest should give it a clear advantage over the baby songbirds and allow it to catch a significant portion of the popcorn. To simulate the real-life situation of resources, limit the amount of popcorn the parent can throw.
6. Continue until the parent has used the popcorn, then have the baby birds count their pieces. How many survived?
8. After tallying the popcorn catch, share more popcorn with all students.
9. Discuss how many songbirds survived. Why did so few survive? How much popcorn did the cowbird catch? Why?
10. Define cowbird parasitism. Explain that cowbirds parasitize songbird nests and that brood parasitism from cowbirds is one factor in the population decline of songbirds. Point out that humans have altered the forest, creating more of an edge. This change in landscape has put forest birds in close proximity to cowbirds.

## Discussion Questions:

- If all popcorn caught by the cowbird were distributed to the other baby birds, how many of them would have survived? What impact do cowbirds have on the nesting success of songbirds? What will eventually happen to songbirds if brood parasitism continues?
- Is there anything that humans can do to protect songbirds from parasitism? Is there something that people should do? How have changes in the rural landscape affected cowbird populations? What

The brown-headed cowbird is known to lay it's own eggs in the nests of nearly 250 other bird species.

A single female cowbird is capable of laying nearly one egg per day at the peak of the breeding season, and produces a total of 30 – 40 eggs over the 2 – 3 month breeding period (May-July). Because female cowbirds usually only lay one egg in a host nest, this translates into 30 – 40 nests parasitized per female in one season.

changes have occurred to the local landscape that affect cowbird populations? Who is responsible for the current cowbird situation? Who is responsible for protecting songbirds?

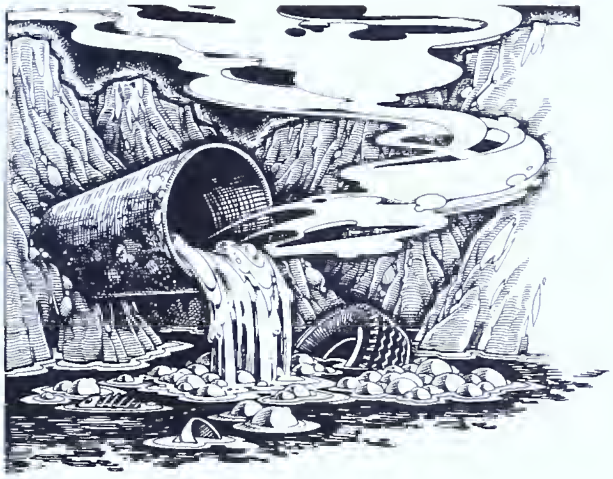
## EXTENSIONS:

- Repeat the activity as if the species have co-evolved, thereby allowing the parent strategies for protecting the nest from parasitic cowbirds.
- Have the entire class participate by creating several simultaneous nests.
- Students could do a report on cowbirds and find out how to recognize their eggs. How do wildlife managers recommend dealing with the cowbird?
- Have students speculate as to why brood parasitism evolved. (Think about the feeding behavior of nomadic cowbirds.)
- Have students research the impact that forest fragmentation has had on other species. What can be done to slow the rate of forest fragmentation?

## EVALUATION:

- Have students describe cowbird parasitism and explain how it affects songbirds.

Adapted with permission from:
Gilchrist, Susan, Row, Kadi and Borneman, David. *One Bird, Two Habitats.* Wisconsin Department of Natural Resources, 1993.



# Lesson 6

# *Deadly Links*

## OBJECTIVES:

Students will give examples of ways in which pesticides enter food chains; and describe possible consequences of pesticides entering food chains.

## METHOD:

Students become "hawks," shrews," and "grasshoppers" in a highly physical activity.

## MATERIALS:

White and colored drinking straws, pipe cleaners, multi-colored dry dog food (30 pieces per student in a proportion of two-thirds white to one-third colored), one bag per grasshopper.

## BACKGROUND:

People have developed pesticides to control organisms. Herbicides are used to control unwanted plants, insecticides to control unwanted insects, etc. When these pesticides involve the use of poisons, the poisons frequently end up going where they are not wanted. Many toxic chemicals have a way of persisting in the environment, and often become concentrated in unexpected and undesirable places, from food and water supplies to wildlife and people.

For example, a pesticide known as DDT used to be applied regularly to crops as a means to control damaging insects. Then it was discovered that DDT entered the food web with damaging results. Fish ate insects that were sprayed with the chemical; hawks, eagles and pelicans ate the fish. The poisons became concentrated in the birds—sometimes weakening and killing them directly, and over time resulting in side effects such as egg shells so thin that the eggs would not hatch or were crushed by parents in the nesting process. Use of DDT is now prohibited in the United States, but is still legal in some foreign countries. Even after the application of DDT is stopped, DDT and its by-products can impact the environment for decades.

**Age:** Grades 4-9

**Subjects:** Social studies, science, physical education

**Skills:** Analysis, classification, comparison and contrast, computation, discussion, generalization, kinesthetic concept development, synthesis

**Duration:** 30-45 minutes

**Group size:** Minimum of ten students

**Setting:** Large playing area

**Key vocabulary:** Pesticide, insecticide, herbicide, food web, accumulate, toxic, chemicals, organic, inorganic

There are many other synthetic chemical pesticides that remain in use in the United States. They include 2,4-D; propoxur; diazinon and carbaryl. Many people use these pesticides in their home, lawn or garden.

Damaging fertilizers are also used by farmers and homeowners. Again, the use of such chemicals—particularly the inorganic, synthesized compounds—has varying side effects. Wildlife and people bioaccumulate pesticides and inorganic compounds; the chemicals do not pass out of their bodies, but concentrate in their systems over time.

Public pressure continues to force changes in the application and availability of pesticides. For example, there is now a growing interest in Integrated Pest Management (IPM). This is an approach that considers the entire ecosystem. IPM can include using a pest predator, as well as other biological controls, to reduce damage from pests. IPM can also include the selective use of naturally-occurring and synthetic pesticides as well as habitat manipulation, and can be combined with timed planting (planting certain crops outside of the windows of time in which specific pests are most prolific or active).

The major purpose of this activity is for students to recognize the consequences of accumulation of some pesticides in the environment.

## PROCEDURE:

1. Tell the students that this is an activity about food webs. If they are not familiar with the term, spend time establishing a definition. (See Background information.)
2. Divide the students into three groups. For example, in a class of 26, there would be two "hawks," six "shrews," and 18 "grasshoppers." (Three times as many grasshoppers as shrews, three times as many shrews as hawks.) Label grasshoppers, shrews and hawks so that they can be easily identified.
3. Hand each "grasshopper" a small bag or other container to represent the stomach of the animal or insect.
4. With the students' eyes closed, distribute the objects representing the food around in a large open space.
5. Give the students their instructions. The grasshoppers are the first to go looking for food. The hawks and shrews are still on the sidelines watching the grasshoppers—after all, hawks and shrews are predators, and are watching their prey! At a given signal, the grasshoppers are allowed to enter the area to collect food, placing it in their "stomachs." The grasshoppers have to move quickly to gather food. At the end of thirty seconds, the grasshoppers are to stop collecting food.
6. The shrews are now allowed to hunt the grasshoppers. The hawks are still on the sidelines quietly watching the activity. The amount of time available for the shrews to hunt grasshoppers should take into account the size of the area in which you are working. In a classroom, 15 seconds may be time enough; on a large playing field, 60 seconds

might be better. Each shrew should have time to catch one or more grasshoppers. Any grasshopper tagged by a shrew must give its bag of food to the shrew and sit on the sidelines.

7. It is now time for the hawks to hunt food, following the same time and rules as the shrew. Shrews may hunt for grasshoppers; grasshoppers are hunting for food chips; and the hawks are hunting the shrews. If a hawk catches a shrew, the hawk gets the food bag and the shrew sits on the sidelines. At the end of the time period, ask all the students to come together in a circle, bringing whatever food bags they have with them.
8. Ask the grasshoppers to empty their food bags and count the number of food pieces they have. They should count the number of white food pieces and the number of multi-colored food pieces. List the number of grasshoppers and the number of white and multi-colored pieces each has; list the number of shrews left and the number of white and multi-colored pieces each has; and, finally, list the two hawks and the number of white and multi-colored pieces each has.
9. Inform the students there is something called a "pesticide" in the environment. This pesticide is sprayed onto the crop the grasshoppers were eating to prevent crop damage. If there were extensive crop damage, the farmer would have less to sell, his livestock may have less to eat, or it may increase the cost of food due to a shortage caused by grasshopper damage. This particular pesticide is one that is poisonous, accumulates in food webs and stays in the environment for a long time. In this activity, all the multi-colored food pieces represent the pesticide. Any grasshoppers not eaten by shrews who have colored pieces in their bag are now considered dead. Any shrews for which half or more of their food supply was multi-colored would also be considered dead. The one hawk with the highest number of multi-colored pieces will not die at this time; however, it has accumulated so much of the pesticide in its body that the egg shells produced by it and its mate during the next season will be so thin they will not hatch properly. The other hawk(s) is/are not visibly affected at this time.
10. Talk with the students about what they have just experienced. Ask them about their observations on how a food web works, and how toxic substances can enter the food web, with a variety of results.

## EXTENSIONS:

- Consider and discuss possible reasons for the use of such chemicals. What are some of the tradeoffs? What are some of the consequences?
- Offer and discuss possible alternatives to pesticides.
- Check newspapers for examples of the issue.
- Conduct the activity using different samples, with the ultimate predator being human.

## EVALUATION:

- Give three examples of ways in which pesticides can enter the food web. What are the consequences of pesticides in the food web?

Reprinted with permission from:
Project WILD. *Project WILD K-12 Activity Guide*. Council for Environmental Education. © 1983, 1985, 1992.

# Lesson 7

# Investigating The Missing Birds

## OBJECTIVES:

Students will be able to name two endangered/threatened bird species in Pennsylvania and explain how they became endangered.

## METHOD:

Students are introduced to the concept of endangered species by presenting a play.

## MATERIALS:

Script, Investigating the Missing Birds (provided), paints, large paper, materials to make puppets, props (telephone, camera, notebook, binoculars), four chairs.

## BACKGROUND:

Ever since humans lit their first fire or domesticated plants, they have influenced their environment. With the advent of the industrial revolution, this impact soared to new heights. Science and technology have expanded life expectancy and decreased infant mortality, which have led to an unprecedented population growth. Around 1830, the world population reached one billion people. Since then, another 4.9 billion people have been added. This expanded growth has placed tremendous pressure upon our natural resources and has reduced habitat for many forms of wildlife.

In order to provide food and shelter for our growing masses, we have cleared forests, drained wetlands, plowed prairies, and diverted water onto fields. The overuse of some agricultural land has led to its abandonment, as the soil became depleted of its life-sustaining minerals. Pesticides have found their way into the food web, nearly eliminating our national symbol, the bald eagle. Our soil, water and air carry in them particulate matter from various industries and exhaust from combustion engines.

Decisions we make everyday, from whether to walk or take the bus to what products we buy, impact the survival of the species with which we

**Age:** Grades 4-8

**Subject:** Science, art, language arts

**Skills:** Deduction, role-playing, drama, art, research, oral presentation

**Duration:** Several class periods

**Group size:** Small class

**Setting:** Indoors

**Key vocabulary:** Threatened, endangered share the planet. This play introduces the student to a serious topic in a light way.

## PROCEDURE:

1. Review from prior lessons the importance of habitat. What factors have changed habitat for birds and other wildlife? List these on the board.
2. Ask students to think about changes to habitat that they have witnessed in their local community. Encourage them to think about positive and negative changes, such as a park, conversion of an abandoned building to a garden area, development of a mall, etc.
3. Explore the reasons why these changes occurred. How do they benefit and harm habitat?
4. Explain to the students that they are going to perform a play that explores the connection of habitat and birds.
5. Choose students to play Sara, Juan and the Narrator.
6. Assemble a crew of students to research the four habitat backdrops (coniferous wetland, Susquehanna River at Harrisburg, forest, Pittsburgh) and the four species of birds (yellow-bellied flycatcher, great egret, yellow-throated warbler, peregrine falcon), as well as a golf course and props for the play. Present their findings to the class.
7. Have students draw and paint puppets and backdrops. For increased involvement of students, have them simulate the ecosystems in which each bird is found. They could be swaying trees, fish for the egret, golfers on the golf course, etc.
8. Practice play. Present to another class.
9. Debrief by asking questions such as: Are reintroduction programs, such as that for the peregrine falcon, successful? Why, or why not? How does a dam affect the food web of a great egret? Which is better habitat, a golf course or a forest? Why? A golf course or a shopping center? Why?

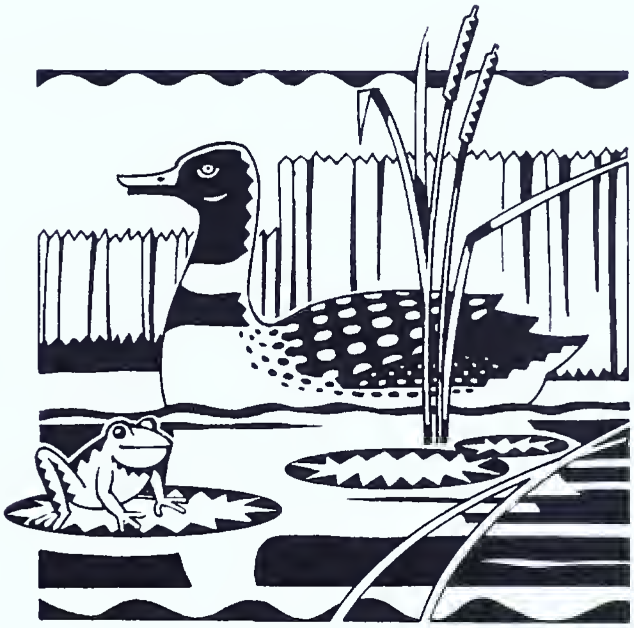
## EXTENSION:

- Research other endangered or threatened birds and the stressors that have placed them on the list.
- Explore the question: What role do humans have in the preservation of plant and animal species?
- Create a simulated town meeting concerning a proposed development that will impact the local ecosystem.
- The collection of items such as plants, nests, feathers, and seeds, has a tremendous impact on species survival. To introduce this concept, see "Rare Bird Eggs for Sale," a *Project Wild* activity.

# EVALUATION:

- Have students list three scarce birds in Pennsylvania, differentiate between endangered and threatened, and give examples of three positive and three negative impacts humans have had on habitat.

Adapted with permission from:
*Illinois Birds,* Illinois Department of Natural Resources, Educational Services.



## INVESTIGATING THE MISSING BIRDS

Characters: Sara, a student and conservation private eye
Juan, a student and conservation private eye
The Narrator

Birds: Yellow-bellied flycatcher, yellow-throated warbler, great egret, peregrine falcon

Habitats: Harrisburg (the Susquehanna River), Pittsburgh, a forest, a golf course, a coniforous wetland

The stage is set to reveal a desk or table and two chairs at the front of the stage. On the desk is a telephone. Front and center are two more chairs, placed side-by-side and facing forward. The habitat backgrounds and students portraying the backgrounds should be placed in different locations around the stage area. The play opens with Sara sitting at the desk or table, looking over the pages of a report in a file folder with a large red question mark on it. The Narrator stands stage left and introduces the scene.

Narrator: Welcome to the district offices of those ace investigators, the Conservation Private Eyes. Their natural curiosity makes them ever on the lookout for strange happenings in the world around them. Let's listen in as another mystery begins to unfold.

Sara: *(Shaking her head and speaking to herself)* This is positively frightening! Some of our finest feathered friends are threatened and endangered--right here in our very own state. I think we'd better get to the bottom of this with a little Conservation Private Eye research. *(Sara pushes a button on the telephone and calls an associate)* Juan, could you come in here right away, please? We have a case to investigate.

Narrator: Sara just discovered that of the 9,000 species of birds in the world, 226 are listed as endangered. Pennsylvania has six endangered species and seven threatened species. *(Juan enters and sits down at the desk)*

Juan: What's the word, partner? I just heard that you're upset about something.

Sara: The word is "endangered," and that is what has me concerned. There are threatened and endangered birds right here in our state. We have to find out why.

Juan: Birds in danger? Someone is making threats against birds? You would think that people would pick on someone their own size. Why should anyone threaten a bird?

Sara: *(Patiently)* No one is beating up on birds. "Threatened" means that a bird species could become endangered and "endangered" means a bird could become extinct, like the dinosaurs. Gone forever.

Juan: That's right! I remember reading the file on the passenger pigeon. There were once millions of them, but the last one died in North America in 1914. What's causing the problem with birds today? Which birds are in trouble?

Sara: Well, this file from Headquarters mentions the yellow-bellied flycatcher, the great egret, the peregrine falcon, and the yellow-throated warbler, and there are others as well. It seems the areas where these birds live—their habitat—is changing. Something is happening to their homes.

Narrator: Sara and Juan's mission, should they decide to accept it, is to find out what is happening to the birds' homes.

Juan: Holy mutating habitat! I think we should explore this.

Sara: You're right; let's get our equipment and get going. I'll bring the project file. *(They gather their binoculars, camera, and notebooks and walk center stage to the next two chairs)*

Juan: I think we have everything. Where's the car?

Sara: This *(pointing to the two chairs)* is the car. Get in; I'll drive. *(Sara sits down and appears to be starting the car, placing two hands on the "wheel")*

Juan: Get in what? *(sitting down)* Looks like two chairs to me.

*(Sara begins to drive as Juan looks about in confusion)*

Narrator: And so the well-meaning investigators begin their journey—by CAR—*(this loudly and in Juan's direction)* to their destination.

*(Sara takes her hands off the "wheel" and begins to look at the files)*

Juan: Hey! Watch what you're doing! Keep your hands on the wheel!

Sara: *(Shaking her head)* We've stopped. I think we're here. *(Sara stands up and steps out of the car, looking first at her file and then around her)*

Juan: *(Looking around)* We're here? How fast did you drive and where is here?

Sara: According to the maps, this is clue #1. All of this area used to be dense forest.

Juan: Looks like a recreation area to me. Look at the lodge over there and the golf course over there *(pointing)*.

Sara: Yes, I see. We're not too far from a forest sanctuary. Let's go visit and see how it should be.

Juan: *(As they approach the forest habitat, Juan raises his binoculars)* Quick, Sara, look at the beautiful bird over there! *(Yellow-throated warbler puppet comes across the scene)*

Sara: I'll try to catch it on film (she raises her camera). I got a couple of good shots for the file. We're lucky we saw one; they're so few left in Pennsylvania.

*(They walk back to the car, stopping as the Narrator speaks)*

Narrator: Sara and Juan continue on their trip. They soon leave the wooded area entering into rolling country and then into a coniferous wetland. They stop and observe clue #2.

Sara: *(Stops driving and looks at the files)* We should be near one of the low-lying areas that the yellow-bellied flycatcher calls home.

Juan: This land looks a little wet *(pointing to the wetland habitat).*

Sara: Yep, it's a coniferous wetland. Maybe we will get lucky and spot the flycatcher.

Juan: Hey, Sara, don't talk so loudly. You'll scare the birds away. *(He raises his binoculars)* Look, Sara, isn't that one over there? *(The flycatcher puppet appears in the wetland as he speaks)*

Sara: I'll take a picture to prove our find. This flycatcher is lucky to find a wetland to call home. The report says that Pennsylvania has lost over half of its wetlands to farming and development.

Juan: When did this happen?

Sara: It has been going on for years, and it's time we think about changing things.

Juan: Can we undo what has been done? By the way, I'm getting hungry. Can we eat?

Sara: Come on, we don't have much time to find our other clues and learn about how we can help. Our next stop is the Susquehanna River. The clue says we can find a bird living near our Capitol.

*(Juan begins to make a face and holds his belly, groaning in mock hunger)*

Narrator: Without time to even pause for food, our Ace Investigtors move on.

*(Sara and Juan sit on the chairs and appear to drive to the next place, a city by a wide river)*

Juan: This seems an unlikely place to find an amazing bird.

*(They jump out of the car and start to the river. Suddenly, a large white bird appears over the water)*

Juan: Holy catfish, what is that huge bird?

Sara: *(Proudly)* THAT is a great egret.

Juan: Oh, yes; I remember reading about egrets. Back in the late 1800s, it was cool to wear bird plumes, feathers, even whole birds on hats and coats, and to put in displays. This was causing many birds to be over-hunted, and nearly a complete loss. It wasn't until some ladies decided to put an end to the fashion and fight for laws protecting the birds that the birds started to recover. Isn't that how the Audubon Society began?

Sara: Right on, Juan. It has taken a long time to get the egrets back, but our files say this river island is a perfect nesting place for egrets.

Juan: I heard that they might raise the level of the dam here. Wouldn't that flood the nesting area? Where would all the egrets nest then?

Sara: You are exactly right. Those are questions that still need to be answered.

Juan: Are there any more clues?

Sara: Yes, Juan, our next clue is in the city of Pittsburgh, and from what I have read, it is a success story.

Narrator: And so the Conservation Private Eyes hit the road one last time.

Juan: Let's stop here by these three rivers. I come here sometimes with my family to watch baseball.

Sara: Okay, it's hard to look for birds and drive in the city. *(They get out of the car and start looking up)*

Juan: What kind of bird would be living here that is threatened and endangered? There seems to be plenty of pigeons. I can't imagine many birds living among these tall buildings. Talk about flight hazard!

Sara: Tall buildings are a hazard for many birds, but one species that was in trouble has learned to make them its home. Look at that bird swooping and diving *(the falcon puppet appears)*.

Juan: Wow! A peregrine falcon!

Sara: Yes, it was close to extinction due to DDT, a powerful pesticide used in the 1950s and 1960s. Rachel Carson, a famous biologist, recognized the damage and warned the people. Now some falcons live in cities such as Pittsburgh, Harrisburg, Philadelphia, Lancaster and Williamsport, roosting on the ledges of buildings. Those pigeons you noticed? Well, they're lunch for the peregrine falcon.

Juan: Not exactly what I had in mind for lunch.

Sara: I guess the mystery of the mutating habitat isn't much of a mystery after all. Our four clues add up to the fact that people are responsible for the loss and destruction of these habitats, and only people can preserve them. We were lucky to see the birds that we did. If we don't do something, our younger brothers and sisters might not be so lucky.

Juan: Yes, Sara, it's up to individuals like you and me. It's up to everyone.

*(The puppeteers join Sara and Juan on stage. Ask audience what they can do to protect species. May need to demonstrate to students how to prompt audience for answers.)*

**There are many things you can do to protect habitat:**
- Participate in bird counts to monitor populations.
- Create a habitat area in your yard or at school.
- Support organizations that protect habitat.
- Write to your elected officials about threats to bird species.
- Live a life that tries to have a minimal impact on the environment.

# Background

After studying the birds of Pennsylvania, chances are students will want to know what they can do to help protect this very important part of our web of life. For that reason, the developers of this publication decided it was necessary to add a chapter on action. We have included lessons for several actions that students can take, as well as a menu of actions that would also be important to our avian friends.

An action project is an activity that gets students involved in an environmental issue or problem, or an activity that aims to improve an environmental problem. An action project that focuses on the local community, is student-chosen and developed, and meets a perceived need are most successful with students. Action projects are appropriate for all age levels--just be sure that the proposed action is age-appropriate. Action education is often multi-disciplinary and lends itself to providing relevancy to everyday learning. The process of identifying, discussing, implementing and reviewing an action problem can foster an environmental ethic.

Researchers have found that different things motivate different people. When deciding on an action problem it is important to recognize these differences. Some people are strongly driven by internal motivation, such as values, beliefs, personality and personal experiences. Just knowing that an environmental problem exists might motivate a student with an environmental conscience. For others, motivation comes in the form of social pressure or the need to join. External motivators, such as reward and punishment, is the third category of motivators. Many people won't respond to a problem unless there is something in it for them.

Students are more likely to become engaged in an action problem if they feel confident in tackling the chosen issue and feel that it will make a difference. Another motivator is to ensure the goals of the action are achievable. The sooner positive results are noted, such as birds at a feeder, the more encouraged the students will be.

The educator must take steps to ensure the success of the action project. Enthusiasm and commitment are a must. As mentioned above, the educator must create a sense of ownership in the students and must be willing to work to break down barriers and celebrate success. The educator's role is that of facilitator, creating an atmosphere of cooperation

Students are more likely to become engaged in an action problem if they feel confident in tackling the chosen issue and feel that it will make a difference.

and trust. A few simple guidelines for the educator are:

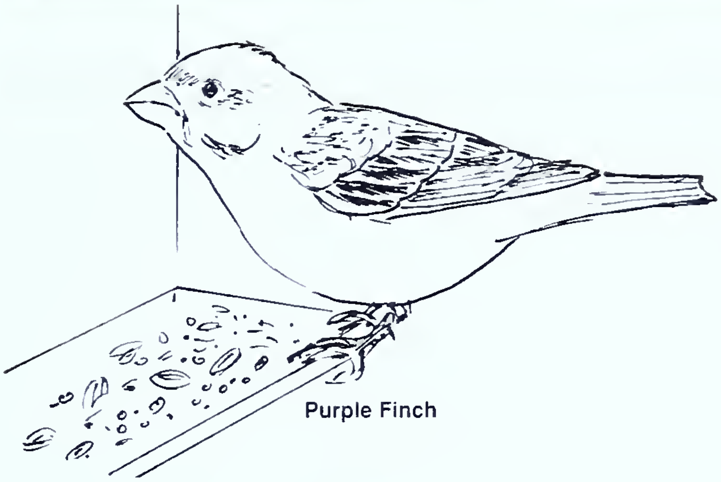
- be prepared
- stay positive
- be respectful
- keep trying
- welcome change and surprise

As with any educational endeavor, evaluation of an action project is important to aiding students' understanding of their personal growth. A few ideas for evaluation follow:

- Keep a video or photo log of the highlights. This can be used for discussion, review and to share the project with a wider audience.
- Collect memorabilia to create a scrapbook. Encourage students to add their thoughts to this scrapbook, as well as their reactions to various components of the project.
- Have students write essays describing how they believe they have changed as a result of the project.
- Students should keep a daily journal throughout the action project. In it they record thoughts, feelings, setbacks, success stories and other information important to them.
- After instructing students on how to give feedback, have them evaluate themselves and the other members of their group. Structure this to focus on specific aspects of the project, such as contribution to the project, efforts and so on.
- Have community members involved in the project assess the students.
- Share your action projects with other teachers, the community and the administration. Learn from the experiences of other educators.

*See Bibliography for references.*

**Tree Swallow**


Purple Finch

## Lesson 1

# *Bird Feeding*

## OBJECTIVES:

Students will be able to identify bird foods preferred by bird species in the area; recognize the conditions necessary for species survival; and provide supplemental feeding for wintering birds.

## METHOD:

Students create a feeding station for observing birds.

## MATERIALS:

Variety of bird seeds, feeders (can be constructed as part of the learning process or have the Industrial Arts class make), *Bird Species and Their Food Preferences Sheet.*

## BACKGROUND:

Wildlife, like humans, need four components for survival—food, water, shelter and space. The availability of these components in a neighborhood, schoolyard or backyard will determine the number and types of birds (and other wildlife) a person will be able to attract to a feeder.

Hedges and conifers provide nesting sites for birds during the summer, and shelter during the winter. Certain plants provide food for wildlife. Berries, such as cherry and raspberry, provide spring and summer meals. Sunflowers and thistle provide food into fall. Crabapples, nut-bearing trees, hollies and vines are winter crops. Grassy patches and flowers, such as black-eyed Susan, goldenrod and sumac, provide seeds for birds during winter. Water is essential year-round and should be kept ice-free during the cold winter months.

Locate bird feeders where they can be easily refilled and in a location that provides cover from predators. Consider visibility for observational purposes, but be sure that the observers will not distract the feeding birds. Place feeders out of the wind if possible.

During the winter, a bird will eat 30 to 80 percent of its body weight each day. This is like an 80-pound person eating 300 hamburgers a day!

**Age:** Adaptable for all levels

**Subject:** Science, math, art

**Skills:** Knowledge, classification, comparison and contrast, identifying relationships and patterns, predicting, observation

**Duration:** Varied

**Group size:** 25

**Setting:** Indoors and out

**Key vocabulary:** Suet, millet, sunflower seeds, perching

Studies have found that black oil sunflower seeds are the most popular feed for attracting birds. Goldfinches can be attracted by niger thistle, while insect-eating birds, such as the nuthatch, prefer suet. Many commercial bags of bird seed contain fillers, such as milo, wheat, hulled oats, rice groats and flax, which are not highly used by birds. Although these commercial brands may seem less expensive, in actuality many of the seeds are tossed to the ground.

## Feeding Styles:

Birds have different types of bodies, bills and feet, which leads to different eating styles and food preferences. Consequently, to attract the most diversity of birds, various forms of feed must be utilized.

Black-Capped Chickadee

Some birds prefer to eat from the ground, often eating the spill from hanging feeders. Examples include cardinals, blue jays, sparrows, doves and juncos. These birds can be fed by placing food on the ground or on a tray mounted on a pole, post, stump or legs.

Other birds, such as goldfinches, chickadees and titmice prefer perches for feeding. These free-swinging hanging feeders take many forms. Whatever the form, the feeder should be placed at least five feet off the ground and away from squirrels and other predators.

Clinging feeders provide no perches, and come in forms like suet logs and dead trees. Birds that have adapted to clinging, such as the downy and red-bellied woodpecker, use these feeders.

## Problems:

At times, problems might be encountered while bird feeding. These problems range from squirrels to house cats to competition from non-native bird species such as house sparrows and starlings.

House sparrows and starlings, both introduced species, are not protected by law and can therefore be trapped or selectively removed. These species can also be deterred from feeders by using hanging feeders without bottom trays. Shortening perches to less than one inch is also helpful. Another approach is to provide enough food for all species by placing a ground feeder a distance away from the hanging feeder.

Squirrels are very adept at reaching bird feeders. Although no method has proven to be 100% effective, squirrels may be deterred by wiring feeders closed, adding baffles above and below the feeder, and using metal posts or clothesline. Again, as with invasive birds, another approach would be to provide plenty of food for all.

House cats are particularly harmful to birds. Educating cat owners and supporting neuter/ spay programs for stray cats can help reduce the impacts that cats have on birds.

## PROCEDURE:

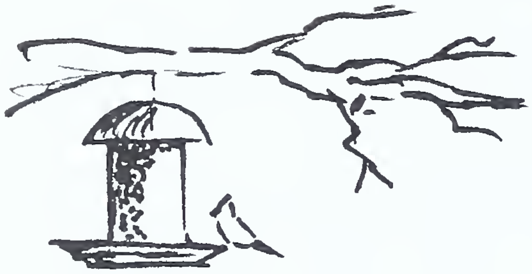
1. Brainstorm with students what birds need to survive *(food, water, shelter and space)*. How does this compare to human needs? How does this compare to the needs of other animals? What conclusions can be drawn from these observations? *(All species need the same elements for survival.)*
2. Ask the students to perform an informal survey of favorite foods of classmates. List these foods on the blackboard. State that different birds also prefer different foods. Birds are adapted to eating different foods (see Chapter 1) by their bills, feet and the habitat in which they live. Discuss some of the different foods eaten by birds. Ask: Does our schoolyard provide birds with these foods?
3. Have students do an informal survey to see if their schoolyard provides birds with food and water.
4. Explain that the design of the feeder determines what a bird must do to secure a meal, and which birds are able to utilize the feeder. When purchasing or constructing a feeder, consider the number and size of perching surfaces. Show the students sample bird feeders, pictures of feeders, or plans for making feeders. What kinds of behavior will the birds need to utilize the feeder? What are the benefits and drawbacks of each type of feeder?
5. Have students construct the following feeders. Resources for plans can be found in the Appendix, or have the students research plans for constructing feeders.
    - **Ground feeder:** There are a variety of styles for ground feeders. The wood should be pre-cut. Have the students use hammers and wear safety goggles. Fill ground feeder with sunflower or mixed seed.
    - **Hanging feeder:** Hanging satellite feeders are very selective as they are unstable and require perching on a narrow rim. There are many varieties of hanging feeders. Some birds that may visit the hanging feeder include chickadees, American goldfinches, house and purple finches and pine siskins. Fill these feeders with sunflower seeds or sunflower hearts.
    - **Suet stations:** There are several varieties of suet feeding stations that the class may choose to make. Suet can often be obtained at no cost or inexpensively from the local grocery story or butcher.
    - **Fruit or sugar solution stations:** Some birds, such as cedar waxwings, robins and catbirds, enjoy fruits, such as chopped apples, bananas, oranges and raisins. These can be placed in the branches of trees or in special holders that the students can make. Hummingbirds enjoy a sugar solution of one part sugar to four parts water. Boil the water. Remove from heat. Add sugar, stirring until sugar is dissolved. Never use honey in a hummingbird feeder, nor should red food dye be added to the solution. Clean feeders weekly.

  - **Water:** Do not overlook the need for water when establishing the feeding stations. If the feeders are not near a natural source of water, such as a pond or stream, place water near the feeders. Keep the water fresh and thawed year-round.

6. Once feeders are in place, check and fill regularly.
7. Have students observe birds at feeder and keep track of birds observed through lists, drawings and/or photographs.

## EXTENSIONS:

- Provide other seeds, such as millet, thistle and peanut hearts.
- Compare types of bird feeders containing the same food items. Do the same foods in different feeders attract the same or different birds?
- Compare "bargain" seed mixes to "premium" seed mixes. Which attract more and varied birds? Which appear to have more waste, as evidenced by the amount of seed pushed to the ground and not eaten? Based upon the findings, which is a better buy?
  - Analyze the content of a bag of seed. Is it as presented on the label? Do this for several brands. Is the labeling accurate? If not, consider a class project of letter writing to the company explaining the class's findings.
  - Have the class experiment with developing their own seed mix, based upon their research of food preferences.
- Refer to Chapter 5, Lesson 2 to set up a feeding experiment.



## EVALUATION:

- Students write a story about the birds they observe at the feeder.
- Students identify the birds at the feeder.
- Students explain the positive and negative benefits feeding has on bird populations.

## RECOMMENDED LITERATURE:

Atwood, Margaret. *For the Birds.* Firefly Books, 1990.
Wolf, Ashley. *A Year of Birds.* New York: Puffin Books, 1984.

Adapted with permission from:
Zalatel, Linda, Hollif, Rick and Brown, Beth. *A Teacher's Activity Booklet About Iowa Birds.* Iowa Ornithologist Union and Iowa Conservation Education Council, 1992.

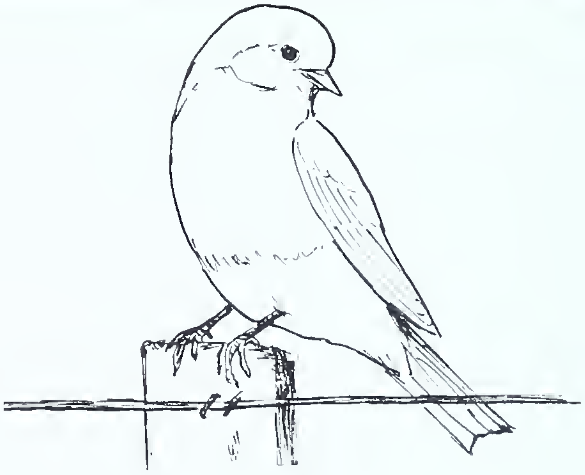
## BIRD SPECIES AND THEIR FOOD PREFERENCES

| | |
|---|---|
| BLACK OIL SUNFLOWER | Cardinals, blue jays, chickadees, evening grosbeaks, nuthatches, tufted titmice, purple finches, and downy, hairy, and red-bellied woodpeckers |
| SUNFLOWER HEARTS | White-throated sparrows, goldfinches, house finches, cardinals, blue jays, chickadees, evening grosbeaks, nuthatches, tufted titmice, purple finches, and downy, hairy, and red-bellied woodpeckers |
| PEANUT HEARTS | Blue jays, juncos, nuthatches, and downy, hairy, and red-bellied woodpeckers |
| WHITE PROSO MILLET | House sparrows, mourning doves, tree, field and song sparrows, white-throated sparrows, and juncos |
| NIGER THISTLE | Goldfinches, and house and purple finches |
| CRACKED CORN | Juncos, mourning doves, blue jays, white-throated sparrows, and grackles |
| SUET | Downy, hairy, and red-bellied woodpeckers, nuthatches, flickers, and chickadees |
| SUGAR WATER | Hummingbirds |
| FRESH FRUIT | Cedar waxwings, catbirds, orioles, and robins |

Seeds that are not preferred are milo, hulled oats, rape, wheat, and red proso millet.

# Lesson 2

# Bluebird Trails



**Age:** Grades 4-12

**Subjects:** Science, art, mathematics

**Skills:** Identifying relationships, observation, predictions, problem-solving

**Duration:** Ongoing

**Group size:** 20

**Setting:** Indoors and outdoors

**Key vocabulary:** Insecticide, clutch, incubation, brood

## OBJECTIVE:

Students will identify the parameters necessary for bluebird habitat. After establishing where proper habitat exists, students will create a bluebird trail.

## METHOD:

After assessing the needs of bluebirds, students develop a checklist of components necessary for bluebird habitat. Using the checklist, students assess their schoolyard or other public area (or private area, if permission is granted) for the possibility of a bluebird trail.

## MATERIALS:

Paper, wood (pre-cut for activity), materials to construct boxes (hammers, galvanized screws or ring-shank nails and screwdrivers), monitoring sheets. Contact the local office of the Pennsylvania Game Commission for bluebird box kits.

## BACKGROUND:

The eastern bluebird, once abundant in the eastern half of the United States, has faced population decline since the 1930s. Once a symbol of happiness, luck and hope, as few as ten percent of historical counts remain.

Bluebirds have declined because of human impacts on their habitat. Bluebirds, which are cavity-nesters, depend upon hollow trees or wood fenceposts to call home. As trees are removed from wood lots and steel posts replace wooden, bluebirds no longer have a place to call home. The insects they depend upon for food succumb to insecticides, or introduce the insecticide into the bird, which kill both nestlings and adults. Competition from non-native bird species, such as house sparrows and starlings, also play a role in the decline of bluebirds. Finally, natural predators, including raccoons, opossums, snakes, and a parasitic insect called the blowfly, and introduced predators, such as house cats, have impacted bluebird populations.

To counter the decline in bluebird numbers, interested folks have begun to construct bluebird trails, a series of human made nesting boxes placed in areas that provide good habitat. Bluebirds prefer open land near wooded areas, such as orchards, pastures and crop lands scattered with trees. The area should contain a grassy section to support the insect populations upon which bluebirds feed (such as grasshoppers, beetles, crickets, butterflies and cutworms). Bluebirds also prefer plants such as sumac, poison ivy, elderberry and dogwood. Trees or wooden fenceposts are ideal for nesting, but when not available, bluebird boxes can be substituted. These cavity nests provide protection from hawks, owls, crows and jays.

The male bluebird returns to Pennsylvania in late March or early April. He scouts the area in search of potential nesting sites, staking out his territory. The female soon arrives, and answers to his mating ritual. The female makes the final choice for the summer home, with nesting usually occurring in late April. Together, they build a nest in the cavity—a cup-like structure of grasses and weeds.

A clutch of three to six glossy, pale blue, bluish-white, or, occasionally, pure white eggs is laid, usually one per day. Incubation, which lasts 12 days, is normally done by the female. All eggs hatch on the same day, and remain in the nest for about 16-20 days, fed by both parents. Upon fledging, they are taught to fend for themselves, and will often help in the rearing of a second brood. When autumn approaches, the bluebirds return to their southern homes.

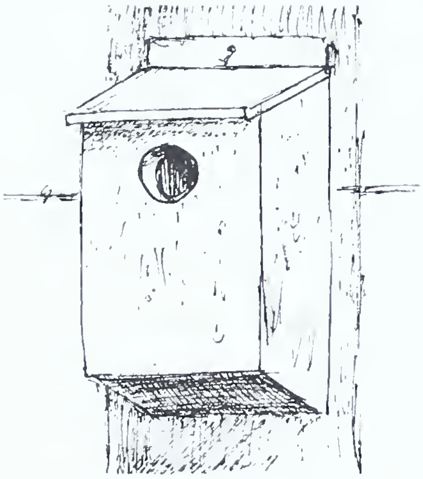
Young bluebirds hatched early in the season help their parents feed, clean, and care for late-season broods.

## PROCEDURE:

1. Introduce bluebirds by sharing with the students the information found in the background section. Divide the class into four teams to research the following topics:
   - Habitat requirements for bluebirds
   - Human impact on bluebird populations/effects of pesticides on bluebird populations
   - Characteristics of bluebirds
   - Bluebird migration/wintering areas
2. Have the students share their findings with the class.
3. Based upon the information presented, have the students develop a checklist of habitat needs for bluebirds. This could be accomplished in writing or by having students draw a picture of an ideal habitat.
4. Using the checklist, have students survey the schoolyard for a potential bluebird trail. Other areas may also be used, such as a local park or private yard, if permission is granted. Is the area suitable for a bluebird trail? Why or why not? If not, what could be done to improve the area or where could an alternate site be located?
5. Have the students determine how many boxes are needed. As some bluebird boxes are utilized by other species, such as the house sparrow, it is recommended that two boxes be placed on the same pole, or near each other, as the bluebird and house sparrow can cohabitate in close

proximity if ample nesting sites are available. Experts recommend placing the grouped boxes 300 feet apart, due to the territorial nature of the bluebird. This also ensures each nesting pair a more viable food source.

6. Students in groups of four or five can construct a box. Encourage cooperation and problem-solving among students. Depending upon the age of the students, it may be helpful to have several adult volunteers. Utilize the diagrams and instructions which follow. Number all boxes in sequential order, so that data can be collected on use, clutch size and productivity (number of successful hatches and fledglings). If vandalism is a problem, discuss with students their ideas for addressing the problem. Painting, staining or varnishing the boxes is discouraged.
7. Mounted boxes should face south or east, and should be oriented towards a tree or shrub for the fledglings' first flight. Avoid brushy or heavily wooded areas, as well as buildings, feed lots and homes. These are the territory of the house sparrow and house wren.
8. Check boxes daily during the nesting season. One side of the box should be removable for ease in cleaning.
9. Have the students decide what parameter they would like to monitor, and develop a data collection sheet that meets their goals.


Eastern Bluebird nest

## EXTENSIONS:

- Experiment with the various designs of bluebird boxes available. Which design proved most successful? Is that design successful when located in another area?
- Have students write a poem or story about the bluebird trail.
- Have students develop a map and interpretive signs for the bluebird trail. Share these maps with other students, faculty, administration, school board members and parents.
- Develop a "Bluebird Journal" for each nest box. Included in this journal could be the date on which the male arrived, the date eggs were laid and number of eggs, incubation, fledging, photographs, climatic conditions during observations, observations made, number of broods per season, date of departure, etc.
- Contact your local state park to learn more about volunteering in the park's own bluebird trail construction projects.

## EVALUATION:

- Students will gather data based upon group goals. Based upon the data, discuss the success of the bluebird trail. What, if any, modifications can be made to improve the trail?

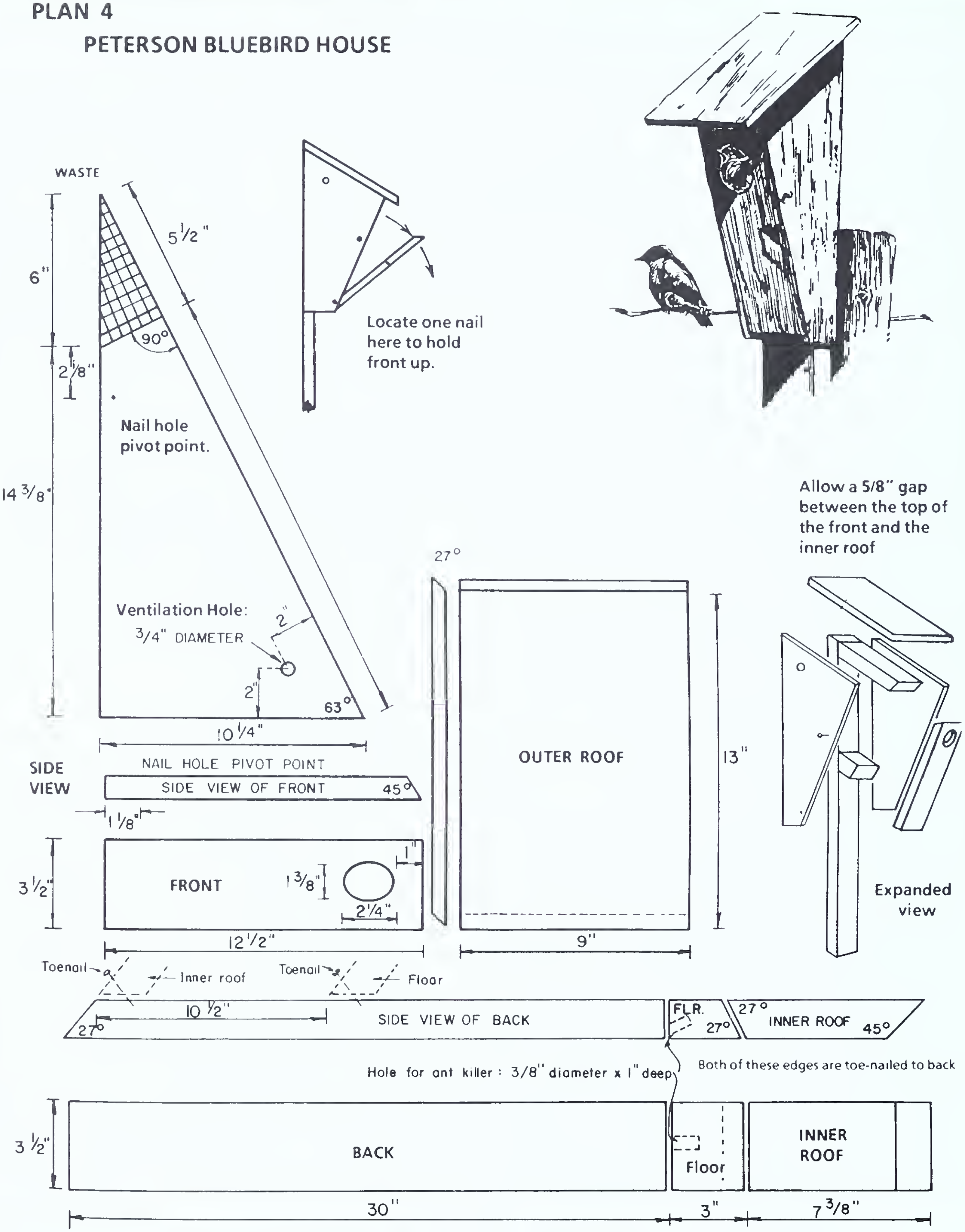
## RECOMMENDED LITERATURE:

Horsfall, R. Bruce. *Bluebird Seven.* Portland: Audubon Society of Portland, 1978.

Adapted with permission from:
Zaletel, Linda, Hollif, Rick and Brown, Beth. *Iowa Birds, Blazing a Bluebird Trail.* Iowa Ornithologist Union and Iowa Conservation Education Council, 1992.

## PLAN 4

## PETERSON BLUEBIRD HOUSE



Locate one nail here to hold front up.

Nail hole pivot point.

Ventilation Hole: 3/4" DIAMETER

Allow a 5/8" gap between the top of the front and the inner roof

Expanded view

Hole for ant killer: 3/8" diameter x 1" deep

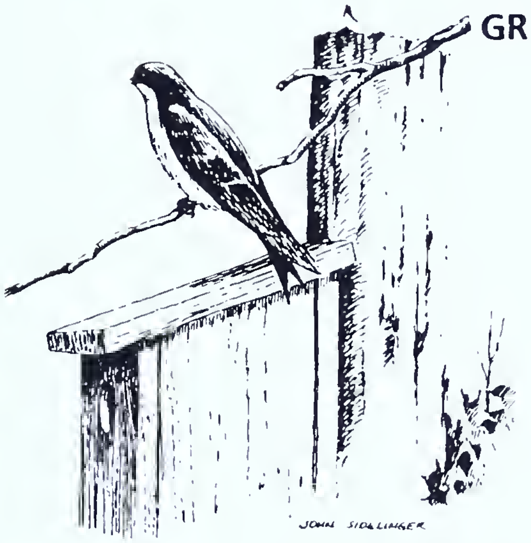
Both of these edges are toe-nailed to back

Source: *Woodworking For Wildlife*
*PA Game Commission and PA Wild Resource Conservation Fund*

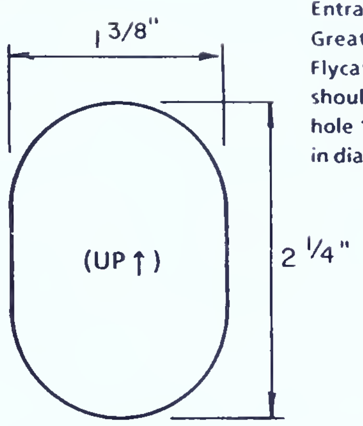
## PLAN 5

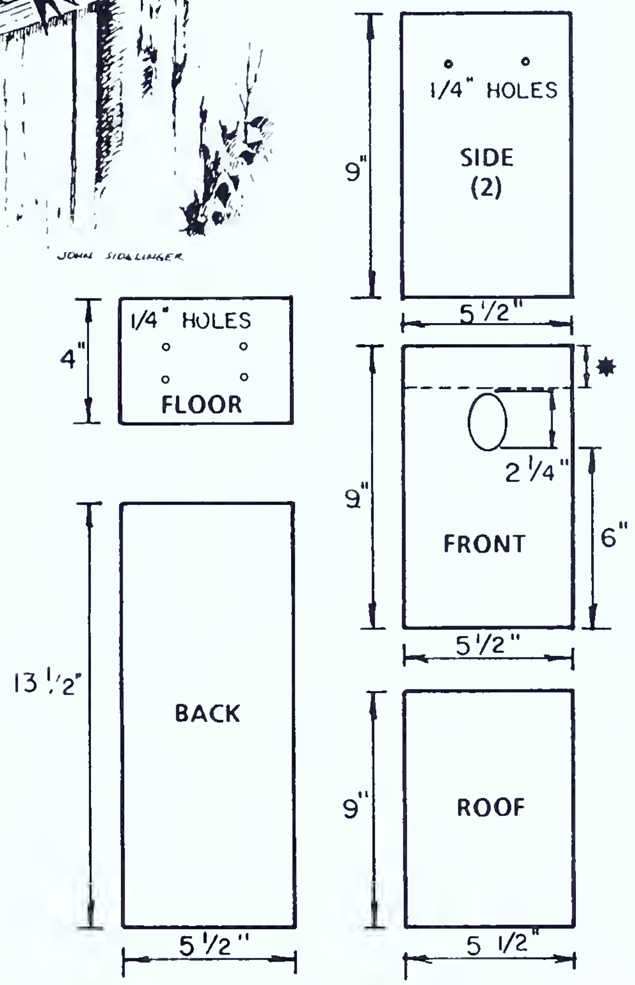
### NEST BOX FOR:

### TREE SWALLOW
### EASTERN BLUEBIRD
### GREAT CRESTED FLYCATCHER

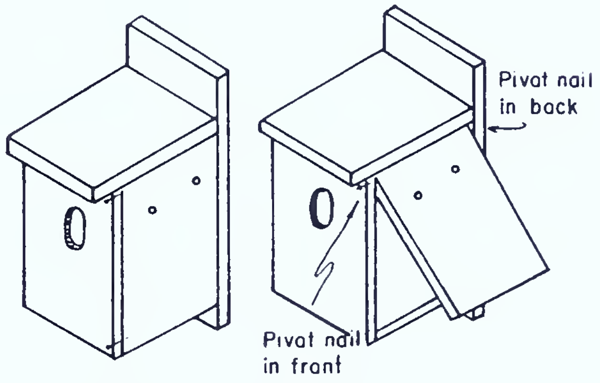


NOTE:
Entrance hole for
Great Crested
Flycatcher
should be a round
hole 1¾"
in diameter





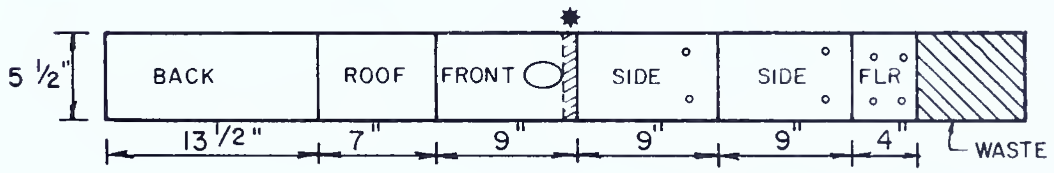
✱ NOTE: IF SLOT ENTRANCE IS USED, FRONT WILL MEASURE 5½" x 7½." LEAVE OPENING AT TOP.



TWO "PIVOT" NAILS ALLOW SIDE TO SWING OUT FOR CLEANING.
USE ONE NAIL AT BOTTOM TO CLOSE SIDE.

NAIL HOLDS
SIDE CLOSED.

LUMBER:
ONE 1" x 6" x 6'

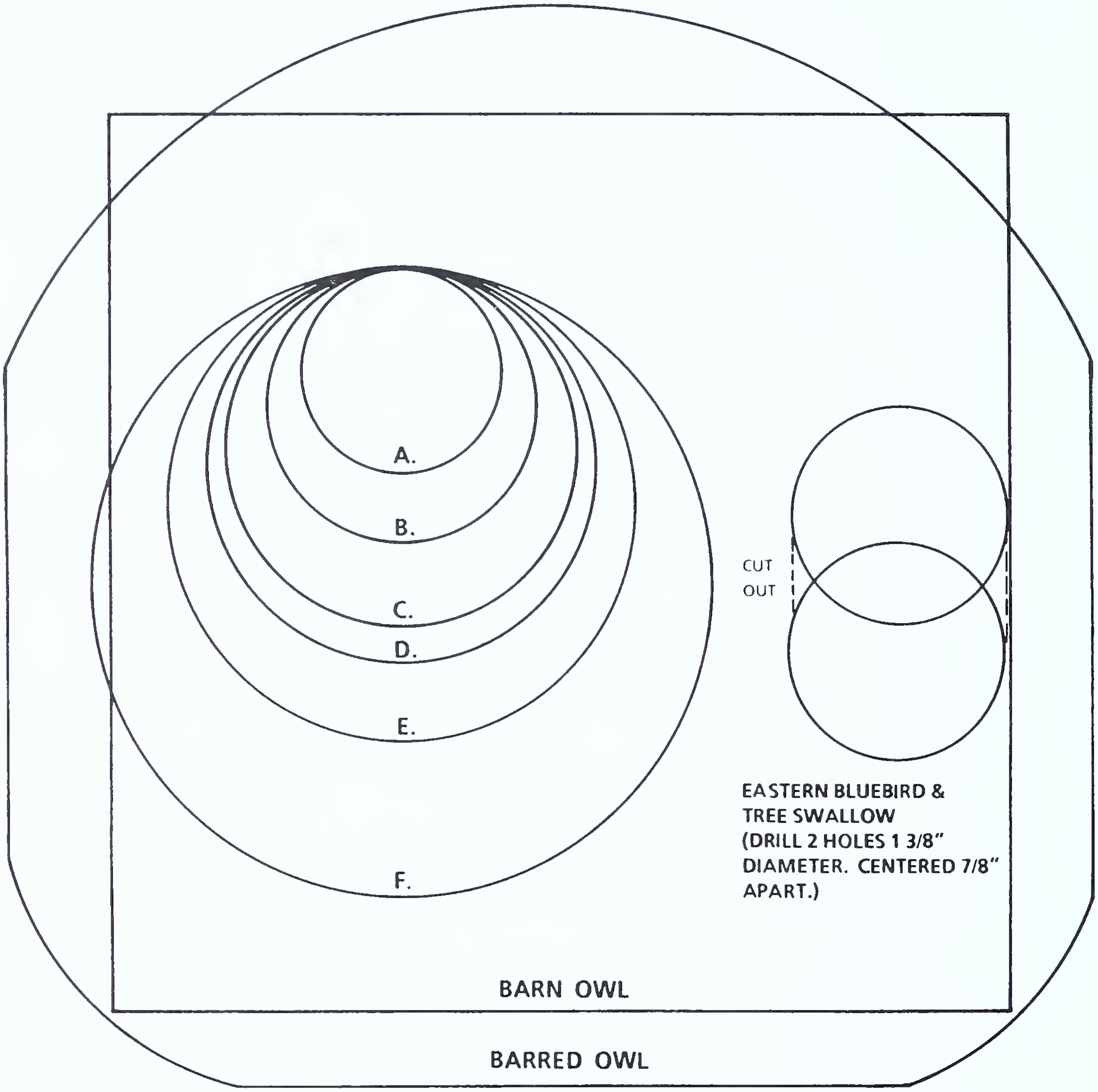


Source: *Woodworking For Wildlife*
*PA Game Commission and PA Wild Resource Conservation Fund*

## PLAN 24 ENTRANCE HOLE SIZES FOR SONGBIRD, WOODPECKER, AND SQUIRREL NEST BOXES.

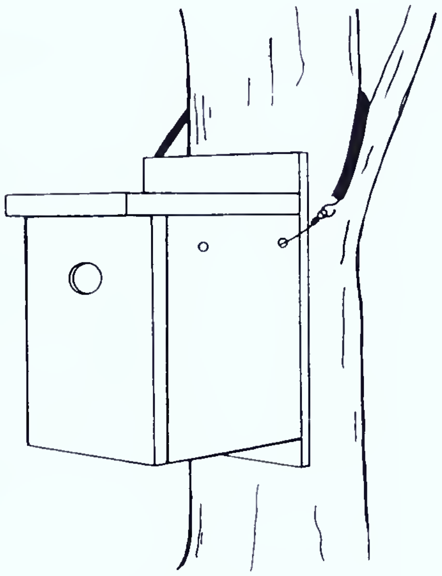
Source: *Woodworking For Wildlife*
*PA Game Commission and PA Wild Resource Conservation Fund*

TRACE ONTO WOOD WITH CARBON PAPER

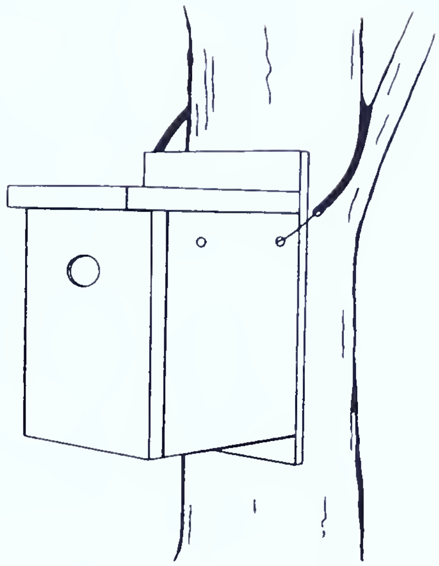

A.
B.
C.
D.
E.
F.
CUT OUT
EASTERN BLUEBIRD & TREE SWALLOW (DRILL 2 HOLES 1 3/8" DIAMETER. CENTERED 7/8" APART.)
BARN OWL
BARRED OWL

A. HOUSE WREN, BLACK-CAPPED CHICKADEE, WHITE-BREASTED NUTHATCH, TUFTED TITMOUSE AND PROTHONOTARY WARBLER
B. GREAT CRESTED FLYCATCHER
C. PURPLE MARTIN
D. COMMON FLICKER
E. GRAY AND FOX SQUIRREL, SCREECH OWL, AND AMERICAN KESTRAL
F. PILEATED WOODPECKER

## PLAN 26 (continued)
### NEST BOX HANGING TECHNIQUES

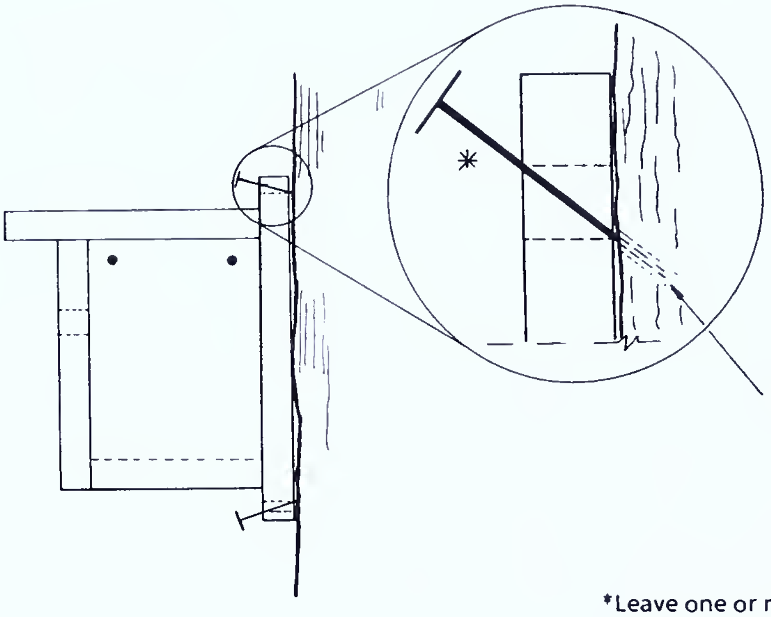


B. BUNGEE CORD



NOTE WIRE
GOING THROUGH
BACK, AIR
VENT HOLES

C. WIRE THROUGH HOSE



Angle nails
as shown

predrill 1/4" hole

*Leave one or more
inches protruding
from hole

D. ALUMINUM NAILS

Source: *Woodworking For Wildlife*
*PA Game Commission and PA Wild Resource Conservation Fund*

# Lesson 3

# *Adoption Option*

Northern (Baltimore) Oriole

## OBJECTIVE:

Students will take an active part in the preservation of bird species by adopting a park, National Wildlife Refuge, bird from the Audubon Watchlist, local zoo or rehabilitation center.

## METHOD:

Students adopt a park, refuge or bird.

## MATERIALS:

Refer to Appendix for Audubon Watchlist and adoption programs.

## BACKGROUND:

With information about habitat fragmentation and degradation in their hometown or state, and the decline of songbird species, students will probably wonder what they can do to change these trends. Many programs exist that allow individuals and groups to adopt significant habitat, including wetlands, rainforests, parks, refuges as well as adopt certain bird species. Refer to the Appendix to learn more about the options available.

## PROCEDURE:

1. Students should decide what they would like to adopt and what their objectives are for adopting.
2. Brainstorm adoption possibilities. Refer to the Appendix for options that might be available, as well as research in the library and through local environmental organizations, zoos and nature centers.
3. Have students write to the organization, zoo, refuge or other area that they would like to consider adopting. Students should be encouraged to explore as many avenues as possible.
4. After information has been received, have students compare and contrast the various options. How does each fit with the objectives determined above? If more than one option remains after comparing,

**Age:** All ages

**Subjects:** Science, math, language arts

**Skills:** Writing, knowledge, problem-solving, communication

**Duration:** Ongoing

**Group size:** Any

**Setting:** Varied

**Key vocabulary:** Adoption

have students develop an argument for choosing one over the other. After each side has presented its argument, allow students to vote in a democratic process. Remind students that nobody loses, as they are merely choosing a path to reach the same goal.

5. After establishing an adoption program, students should plan how they will raise the necessary funds and complete the necessary work to meet the needs of the adoption.

## EXTENSIONS:

- Prepare a report about the adoption to share with the school board, parent/teacher association or other classes.
- Write an article for the school or local newspaper.

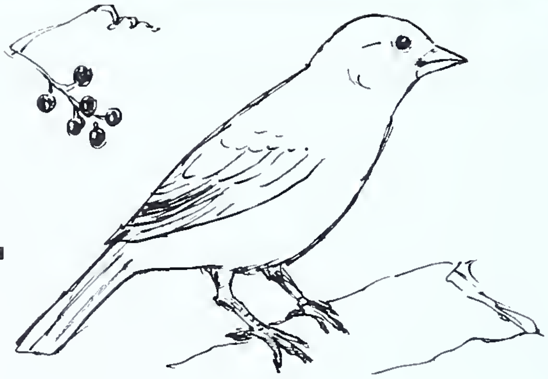
## EVALUATION:

- Students will write and justify their criteria for their chosen adoption.

Developed by Marci Mowery, National Audubon Society, Pennsylvania Field Office.

# Lesson 4

# *A Habitat For Birds*



Indigo Bunting

**Age:** All ages

**Subjects:** Science, mathematics, art, language arts

**Skills:** Knowledge, classification, application, observation, research

**Duration:** Two periods for activity, additional for implementation

**Group size:** Varied

**Setting:** Indoors and outdoors

**Key vocabulary:** Pesticide

## OBJECTIVE:

Students will acquire a general understanding of birds' food, habitat and water requirements. Students will identify on-site actions to benefit birds and other wildlife—i.e., they will create a wildlife habitat.

## METHOD:

Students map a predetermined portion of the schoolyard for its habitat potential and make recommendations for improving habitat on the site.

## MATERIALS:

Large paper, marker, yard stick, bird identification guides, list of local native plants that benefit wildlife.

## BACKGROUND:

Habitat loss is one of the leading causes of species loss. All animals, including humans, need four items to survive—food, water, shelter, and space. The presence of all four comprises a habitat.

Habitat has been lost to development, introduction of exotic plant species, removal of one of the necessary elements (e.g., through the draining of a wetland) and natural phenomena (e.g., succession and wildfires). Each individual can make a contribution to restoring habitat by moving away from the traditional manicured lawn to planting species beneficial to wildlife, by eliminating the use of pesticides and chemical fertilizers and by encouraging plant diversity.

The creation of a wildlife habitat provides students with a hands-on approach to learning. This multi-disciplinary endeavor develops students' decision-making and problem-solving skills, while also developing an understanding of human needs in the context of learning about the needs of wildlife. The topic of habitat provides a means for teaching a broad range of concepts while making learning meaningful. Enhanced self-esteem, community involvement, team-building, improved social and cooperative skills are but a few of the human benefits of creating a wildlife habitat area.

Successful habitat areas are ones that begin with realistic goals. Start small and work toward a larger picture. Consider the cost, time and maintenance factors when planning for a habitat area. Garner support for the project by involving the maintenance staff, community leaders, parents, other teachers and local business owners. These individuals can lend both expertise and resources that will lead to a successful endeavor.

It is important that the project be student-driven. Involve the students in the decision-making process. Have them prepare the request for permission, contact a support group or committee and plan the project. This not only provides a learning experience, but garners the much-needed "ownership" of the project.

A simple checklist for planning a habitat area can help in guiding your path.

- Form a committee made of a mix of people. A committee spreads the workload and provides longevity to the project.
- Map and inventory the campus, schoolyard or other potential site.
- Review the past natural and cultural history of the site.
- Analyze the needs of the school, students, curriculum and community. How can these needs be accommodated in the habitat plan?
- Develop a strategy for reaching the outcomes desired.
- Publicize, publicize, publicize.
- Develop criteria for judging the success of the project.
- Develop a time line, work chart and resources list. Break the plan into achievable steps.
- Develop a maintenance plan.
- Remember to stay flexible and have fun!

For a comprehensive background on habitat needs and creation, see the Appendix for a listing of useful resources. A good source of information for this is the Audubon Council of Pennsylvania's *APATH: Audubon Protecting Animals Through Habitat,* or obtain a copy of *Homes for Wildlife* from the Pennsylvania Game Commission.

## PROCEDURE:

Refer to the resources listed above for directions in evaluating and planting a habitat area. Also, see Chapter 2, Lesson 6.

## EXTENSIONS:

- Ask students to write a letter to invite a natural resource professional to visit the school to discuss ways in which the habitat could be improved for birds.
- Keep a class journal of the activity. Journals could take several themes, such as animals attracted, plant success, etc.

- Contact the Pennsylvania Game Commission, local Audubon chapter, bird club or county extension agent for assistance in developing a schoolyard habitat.

## EVALUATION:

- Students will successfully create a plan and plant an area that will improve wildlife habitat.

## RECOMMENDED LITERATURE:

McLerran, Alice. *The Mountain That Loved a Bird.* New York: Simon & Schuster, 1985.
Mitchell, Joe. *The Magic School Bus: Looking for Liz.* New York: Scholastic, Inc., 1995.
Myers, Christopher and Lynn Born. *McCrephy's Field.* Boston: Houghton Mifflin Company, 1991.
Perenyi, Constance. *Growing Wild: Inviting Wildlife Into Your Yard.* Hillsboro: Beyond Words Publishing, Inc., 1991.

Adapted with permission from:
Mowery, Marci. *APATH: Audubon Protecting Animals Through Habitat.* Camp Hill: Audubon Council of Pennsylvania.
Project Wild. *Wild School Sites, A Guide for Preparing for Habitat Improvement Projects on School Grounds.* Council for Environmental Education. © 1993.
Wyzga, Marilyn. *Homes for Wildlife.* New Hampshire Fish & Game Department.

Tree Swallow

# Lesson 7

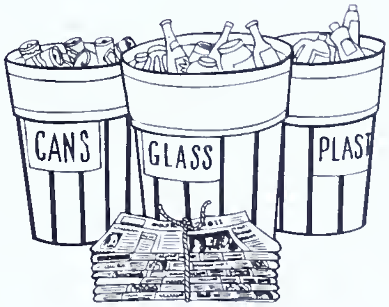
# *Menu Of Actions*

## BACKGROUND

An individual may question whether the effort of one person can make a difference. Yes, it can! Our daily actions can have a positive or negative effect on our songbirds--the choice is up to us.

1. **Learn More and Spread the Word**
   - Continue observing birds and learning more about their natural history, habitat and behaviors. Join the local chapter of the National Audubon Society or bird club. Start a student bird club.
   - Spread the word by writing articles for the school newspaper describing what was learned or interesting discoveries made. Create educational displays for the school, library and local events.
   - Use help from the local media to develop press releases to celebrate Pennsylvania Bird Day (March 21) and International Migratory Bird Day (second Saturday in May) at your school.
   - Write letters to elected officials to let them know how you feel and what you know about birds and habitat. Endorse legislation that protects species and the habitats that supports both wildlife and people, such as the Endangered Species Act and Clean Water Act. Ask for support of national parks and wildlife refuges.
   - Learn more about birds, and share your knowledge with younger students.
   - Plan an activity to help people make the link between human population growth and declining habitat during World Population Awareness Week, celebrated annually during the last week of October.

2. **Change Your Individual Lifestyle**
   - Reduce, reuse and recycle materials. Be a wise consumer. Choose items devoid of extraneous packaging or that utilize recycled or recyclable materials, purchase items in large quantities or in bulk and purchase reusable items where possible.
   - Reduce your use of water, energy and other resources as much as possible.



- Assess your daily actions to see how they impact wildlife. Do you walk whenever possible? Use public transportation? Do you compost your organic waste? Can you make an effort to change those activities that are harmful to wildlife?
- When you are old enough to have a family, consider having only one or two children. Human population growth and the associated habitat destruction are the greatest problem facing our songbirds, wildlife and global ecosystem.
- Support family planning efforts in countries around the world.
- Become active in land use planning and environmental decision-making in your community.
- It is difficult for decision-makers to be experts in all the issues pertinent to governing or law-making. Help to educate public officials about important environmental issues and land use decisions.
- Attend public hearings and town meetings to be a voice for the environment.
- Consider establishing an Environmental Advisory Council (EAC) for your local municipality. Contact the Pennsylvania Environmental Council (1211 Chestnut Street, Suite 900, Philadelphia, PA 19107; 215-563-0250) for more information on creating an EAC.
- Provide research data and information on critical environmental issues.
- Write letters to elected officials telling them how you feel and what you know about environmental protection. Speak out in support of the reauthorization of such important pieces of legislation as the Clean Air Act, the Clean Water Act and the Endangered Species Act.

For information on the
National Audubon Society's
Population and Habitat
Campaign contact
Marci Mowery,
1104 Fernwood Avenue #300
Camp Hill, PA 17011
mmowery@audubon.org
717-763-4985

3. **Provide a Safe Haven for Wildlife**
   - Decrease pesticide use by planting native species, decrease the amount of manicured lawn and using Integrated Pest Management practices.
   - Modify reflective windows to reduce the incidence of bird collisions. Several methods work well. Rub soap on windows to dull their appearance, install screens or one-way tinting, hang streamers or other objects in the window, cover windows with bird netting, plant trees or shrubs near windows, or place a lit lamp inside the window to cut back on the reflection.
   - To minimize birds being hit by cars, do not place food-bearing trees and shrubs too near the road. Also, avoid tossing all trash, including food scraps, along roads for wildlife, as this often leads to fatalities.
   - Keep feeders clean and away from predators.
   - Protect songbirds from domestic cats by keeping cats indoors. Encourage your neighbors to follow suit.
   - Work with local veterinarians and wildlife officials to enact and enforce regulations on free-roaming cats. Also work with them on

Contact your local Humane Society for information on spaying and neutering programs for cats.

spaying and neutering programs to reduce the number of free-roaming cats.
- Increase habitat around the school grounds.

### 4. Volunteer to Help Birds

- There are a number of volunteer opportunities available to help birds. Refer to the Appendix for these volunteer opportunities.
- Participate in one of the volunteer monitoring or counting projects listed in the Appendix.
- Volunteer at your local wildlife rehabilitation center or organize a fund or food drive to support the center. See Appendix for a list of rehabilitators.
- Participate in riparian and roadside clean-up efforts.
- Participate in riparian and wetland restoration projects.
- Contact the Alliance for the Chesapeake Bay (225 Pine Street, Harrisburg, PA 17101; 717-236-8825) for additional information on riparian restoration.

Developed by Marci Mowery, National Audubon Society, Pennsylvania Field Office.

# Bibliography

## *To Chapter Background Information And Appendices*

Brauning, Daniel, ed. *Breeding Birds in Pennsylvania.* Pittsburgh: University of Pittsburgh Press, 1992.

Benson, Delwin E. *Helping Wildlife: Working With Nature.* Wildlife Management Institute, 1977.

Bonney, Rick, et al. *Citizen's Guide to Migratory Bird Conservation: A Project of Partners in Flight.* Ithaca: Cornell Laboratory of Ornithology and National Audubon Society, 1995.

Bookhouse, Theodore A. *Research and Management Techniques for Wildlife and Habitats.* Bethesda: The Wildlife Society, 1994.

Conner, Jack. *The Complete Birder.* NY: Houghton Mifflin, 1988.

Cox, Jim. *Bird Watching Basics.* Tallahassee: The Florida Game and Fresh Water Fish Commission.

Dunning, Joan. *Secrets of the Nest.* New York: Houghton Mifflin, 1994.

Forshaw, Joseph, et al. *The Nature Company Guide to Birding.* Time Life Books, 1996.

Gill, Frank B. *Ornithology* (Second Edition). New York: WH Freeman & Co., 1995

Greenburg, Russell and Reaser, Jamie. *Bring Back The Birds.* Mechanicsburg: Stackpole Books, 1995.

International Migratory Bird Day packets, 1995-96.

Mader, Sylvia. *Inquiry into Life.* Dubuque: William C. Brown, ©1976, 1979, 1982, 1985, 1988.

Project Wild. *Project Wild Activity Guide K-12,* Council of Environmental Education, © 1983, 1985, 1992.

Rupp, Rebecca. *Everything You Never Learned About Birds.* Pownal: Stoney Publishing, 1995.

Santner, Steven, et al. *Annotated List of the Birds of Pennsylvania.* Ornithological Technical Committee, Pennsylvania Biological Survey Contribution #4, ©1992.

*Taking Action.* Council of Environmental Education, 1995.

Terres, John K. *The Audubon Society Encyclopedia of North American Birds.* New York: Wings Books, 1991.

Terres, John K. *The Audubon Society Encyclopedia of North American Birds.* New York: Alfred A. Knopf, 1980.

Thorne, Steven G., et al. *A Heritage for the 21st Century: Conserving Pennsylvania's Native Biological Diversity.* State College: The Pennsylvania State University, 1996.

Wakely, James and Lillian D. *Birds of Pennsylvania.* Harrisburg: Pennsylvania Game Commission, 1994.

Wallace, George J. and Mahan, Harold D. *An Introduction to Ornithology* (Third Edition). New York: Macmillan Publishing Co., Inc., 1975.

Wallace, George J. and Mahan, Harold D. *An Introduction to Ornithology*. New York: Macmillan Publishing Co., Inc.

Welty, Joe E. *The Life of Birds* (Third Edition). New York: Saunders College Publishing, 1982.

# Glossary

## A

**Accumulate**
— to increase in amount or number.

**Adapt**
— slowly evolve or change to fit the environment. For example, ducks have webbed feet and are adapted to swimming in water.

**Adaptation**
— a trait an animal acquires over time to allow it to survive more easily.

**Air sacs**
— special sacs attached to the lungs of a bird that allow it to exchange gasses more efficiently.

**Albumen**
— the egg white in an egg. It protects the developing embryo and is the source of water, protein, and minerals for the embryo.

**Altricial**
— young hatch naked, usually blind, weak and unable to regulate their body temperature - usually confined to the nest and depend on parents for food for up to four weeks.

**Amphibian**
— animals which are adapted to life in water and on land.

**Anting**
— a preening behavior in which a bird either rubs ants into its feathers with its bill or stands on an anthill and lets ants crawl through its feathers, possibly to remove parasites.

**Arrangement**
— the order or manner in which things are placed or exist.

**Art**
— forms of art include music, mime, dance, drama, poetry.

## GLOSSARY

**Atlas**
— (1) a bound collection of maps; (2) a bound volume of charts, plates or tables illustrating any subject, such as the Breeding Bird Atlas.

**Avian**
— of or relating to birds.

### B

**Barb**
— slender, toothpick like branches that form the webs along the sides of the main feather shaft.

**Barbules**
— small hooks that seal the feather like a zip lock bag.

**Binocular vision**
— the act or power of focusing both eyes on a single image, thus gaining good depth perception. Birds use binocular vision when they focus straight ahead.

**Bird**
— a vertebrate having feathers that is warm-blooded and lays eggs; a member of the class Aves.

**Bird banding**
— Research technique in which a small aluminum band is attached to a bird's leg. If the bird is captured again or found dead, and the band number is reported to the U.S. Fish and Wildlife Service, the bander and other researchers can learn about bird movements and longevity.

**Boreal forest**
— coniferous forests located in cold northern/mountainous regions of the Northern Hemisphere.

**Breeding grounds**
— environment where an animal mates and produces offspring.

**Brood**
— the number of birds hatched from a single clutch of eggs.

**Brood patch (incubation patch)**
— an area on the belly of a bird incubating eggs loses its feathers and develops a rich supply of blood vessels. The patch is warm to the touch and helps transfer heat to the eggs. Not all bird species develop brood patches.

### C

**Calcium carbonate**
— hard substance which composes the shell of an egg.

**Calls**
— bird vocalizations that are not songs. Calls are made during courtship, feeding, migration and to warn of danger.

**Camouflage**
— coloring or pattern of a bird's feathers which help it blend in with its surroundings and hide from predators or prey.

**Carnivore**
— a meat eater.

**Carrying capacity**
— the largest number of organisms of a particular species that can be maintained indefinitely in an ecosystem.

**Cavity**
— hole or hollow in ground, tree, logs, fence, etc.

**Cavity nester**
— refers to birds that nest in the hole of a tree, log or nesting box.

**Census**
— an official enumeration of the population, with details as to age, sex, etc.

**Characteristics**
— features which distinguish one species from another.

**Citizen science**
— the use of volunteers, usually trained, to aid in research, such as bird counts and water quality sampling.

**Classifications**
— groupings of animals dependent upon their characteristics.

**Closed circulation**
— blood is carried throughout the body in blood vessels.

**Clutch**
— the number of eggs laid by a female bird during one nesting cycle.

**Cold blooded**
— an animal which cannot maintain a constant internal body temperature. They take on the temperature of the external environment.

**Community**
— a group of habitats and the organisms that inhabit them combined form a community.

**Conservation**
— the use of natural resources in such a way that assures their continued availability.

**Contour feather**
-- stiff feathers that cover a bird's wings and body. They form the outline of the body.

**Crepuscular**
— a species that is most active at dawn and dusk.

**Crop**
— a sac at the bottom of the esophagus in many birds that is used to store food for later digestion.

**Culture**
— the arts, beliefs and traditions of a particular population of a region of the country.

D

**Data**
— experimentally derived facts.

**Dehydration**
— the loss of water from an egg. The hard egg shell prevents dehydration.

**Dependent**
— an organism is dependent on something if it relies on it to perform a task.

**Design**
— to make or create something.

**Differences**
— characteristics that distinguish between two organisms.

**Dilemma**
— any difficult or perplexing situation or problem.

**Distribution**
— the frequency of occurrence or the natural geographic range or place where any item or category of items occur.

**Diurnal**
— active during the day/in daylight.

**Down feathers**
— soft feathers next to the body that provide insulation.

**Dummy nest**
— a nest which is built but not used for shelter. A possible use may be to attract females or to distract would-be predators.

**Dump nest**
— a nest in which many females lay their eggs but which no one guards. This is used by females without mates or by females whose nests were preyed upon part way through the egg-laying process.

**E**

**Eclipse plumage**
— a dull, inconspicuous plumage worn by male water birds immediately after the postbreeding molt - a shortened version of the winter plumage of other species.

**Ecology**
— the science of the relationships between living organisms and their environments.

**Ecosystem**
— all living and non-living things within an area that are linked together by their actions.

**Egg-tooth**
— a small, sharp structure on a baby bird's upper mandible that helps it chip through its shell during hatching. The egg-tooth is usually lost within a week or so after hatching.

**Endangered species**
— a species which is in danger of extinction throughout all or a significant portion of its range.

**Environment**
— conditions in an area influenced by the climate, soil, terrain, and living components.

**Ethics**
— moral guidelines.

**Experiment**
— to try or test, especially in order to prove something.

**F**

**Feather tract**
— special areas on the birds skin from which feathers develop.

**Field guide**
— a book or pamphlet developed for use in identifying different living and non-living components of our world. Usually contains pictures, descriptions, tips to help identify different birds, mammals, etc.

**Field mark**
— a feature, shape, color, pattern or other visible characteristic by which a bird may be identified.

**Fish**
— animal with a streamlined body which is adapted to life in water. A fish's body is covered with scales which protect the body. Breathing is accomplished through gills.

**Fledge**
— to take the first flight. Birds that have just fledged are often called **fledglings.**

**Fledgling**
— a young bird that has just acquired its first true feather and has just left the nest.

**Flight feather**
— a subset of the contour feather, has a hollow tube, the shaft, running the length of the feather and webs on two opposite sides.

**Flocking**
— the tendency of some bird species to band together to form large groups with birds of their own or different species.

**Flyway**
— general routes of travel used by birds when migrating between breeding and wintering grounds. Four major flyways in the United States are Atlantic, Mississippi, Central and Pacific.

**Follicle**
— a small depression or cavity in the skin which contain papilla from which feathers grow.

**Food web**
— the complete set of food links between populations in a community.

**Forage**
— to search for food.

**Fragmentation**
— division of large and continuous tracts of habitat into smaller parcels that are divided by roads, housing developments, or other types of habitat.

G

**Geography**
— study of the earth and its features.

**Gills**
— small slits in the body of a fish which allow the fish to breathe. They are kept continuously moist by water which is passed through them.

**Gizzard**
— the muscular part of a bird's stomach that grinds hard-to-digest food.

**Granivore**
— birds whose main diet consists of seeds.

**Grit**
— small, coarse pieces of stone, sand, some grains.

**H**

**Habitat**
— the place were an animal makes it's home and meets all of it's needs for survival. Components of habitat are food, water, shelter, and space.

**Herbivore**
— a plant eater.

**Home range**
— the area within which an animal normally travels to obtain its needs.

**Hybrid**
— a bird which is the product of the mating between two different species; a cross-breed: e.g., an American Black Duck x Mallard hybrid.

**I**

**Incubation**
— the time a parent must sit on the eggs to keep them warm until they hatch.

**Independent**
— does not need any help to perform a task.

**Innate**
— a behavior that is inherited. For example, some birds' songs are innate, which means the birds can sing them even if they have never heard them before.

**Inorganic**
— refers to chemical reactions and compounds which do not contain both carbon and hydrogen; not organic.

**Instinct**
— a natural impulse or motivation arising from within.

**Interaction**
— any form of contact or relationship between two organisms.

**Interrelationship**
— the way all plants and animals interact with one another and their surroundings.

**Inventory**
— a detailed list of items or the process of making a list of items.

K

**Keratin**
— a hard material that makes up the shaft of feathers.

**Key**
— organisms, used as a guide for taxonomic identification.

L

**Limiting factor**
— that which impacts the well-being of an animal, population or species resulting in death or inability of animal, population or species to thrive. For example, if there is not enough space, space is the limiting factor. Limiting factors can be natural or caused by humans.

M

**Mammal**
— a warm blooded animal characterized by having hair and feeding milk to their young.

**Marsupial**
— Immature embryos that develop in a pouch on the mother's body.

**Microscopic**
— so small as to be invisible or obscure to the unaided eye. Can only be seen clearly or at all under a microscope.

**Migration**
— movement of a species from one place to another, often following a change of seasons.

**Mobbing**
— the attack made on a hawk, owl, or other predator by a group of songbirds.

**Molt**
— the systematic, often seasonal, loss and replacement of feathers.

**Monitor**
— to observe, record or detect.

**Monocular vision**
— the act or power of focusing each eye independently of the other. Birds with monocular vision have a wider field of vision than those birds with binocular vision. Most birds have both binocular vision and monocular vision, depending on where they focus their eyes.

**Monotreme**
— egg laying organism.

## N

**Naturalist**
— a person who is versed in or devoted to natural history (study of objects in nature).

**Navigate**
— to follow a course to a destination.

**Need**
— something necessary for survival, such as food and water.

**Neotropical**
— the area of America which lies between the tropics of Cancer and Capricorn.

**Neotropical migratory bird**
— a bird that moves seasonally between colder climatic regions of North America, where it nests, and warm tropical areas of Mexico, the Caribbean and other parts of Latin America, where it spends the winter.

**Niche**
— the "job" of an animal or plant in its habitat. For example, the niche of a robin could be described as: daytime feeder, worm and berry eater, food for hawks, tree nester, fall and spring migrator.

**Nocturnal**
— a species that is most active at night.

**Non-breeding ground**
— environment where an animal spends the winter, also referred to as the wintering grounds.

## O

**Organic**
— pertaining to an aspect of living matter.

**Ornithologist**
— one who engages in the scientific study of birds.

**P**

**Parasitize**
— to infest or live off another; to lay eggs in the nest of another species, e.g., brown-headed cowbird.

**Pectoral muscle**
— a bird's breast muscles. In most birds, the pectoral muscles are very powerful. They raise and lower the wings during flight.

**Perch**
— a tree limb or other structure on which a bird rests.

**Peripheral vision**
— the area to either side that can be seen with only one eye.

**Pesticide**
— a chemical preparation for destroying pests, e.g., insecticides for insects and herbicides for plants.

**Physiological**
— consistent with the normal functioning of an organism.

**Pipping**
— process of bird hatching from egg; fetal bird breaks out of the egg.

**Placental**
— the embryo is fully developed within the mother's body before birth.

**Plumage**
— refers to all of the feathers on a bird.

**Pneumatic**
— hollow characteristic of bones which minimizes the weight of the bird.

**Population**
— the group of individuals of a particular species in a given area.

**Precocial**
— young hatch covered in down, with open eyes, well-developed legs, and the ability to regulate their body temperature. They are often able to leave the nest and feed themselves within twenty-four hours of hatching.

**Predator**
— an animal that kills and eats other animals.

**Preen**
— to clean, straighten, and fluff the feathers.

**Prey**
— an animal that is killed and eaten by other animals.

**Primitive**
— less evolved; basic.

## R

**Range**
— the entire area within which a species can be found.

**Raptors**
— a bird of prey, such as a hawk or owl.

**Rectrices**
— tail feathers.

**Reptiles**
— cold blooded vertebrates having lungs, an entire bony skeleton, a body covered in scales or bony plates, and a heart with two atria.

**Resident bird**
— a bird that does not migrate, instead it makes it's home in same area all year round.

**Respiration**
— the act or process of breathing. When a bird inhales it takes air into the lungs, where the oxygen of the air is picked up by the blood and carried to the cells of the body.

**Riparian**
— bordering water, at the waters edge. **Riparian area** or **Riparian zone** refers to the vegetation that grows on or near the banks of streams, rivers, lakes and other bodies of water.

**Roosting**
— (1) to sit or rest; (2) to settle or stay, especially for the night.

## S

**Scientific inquiry**
— testing a hypothesis by conducting a survey or some other test to come to a conclusion.

**Shaft**
— a hollow central tube that runs down the center of a feather. It is hollow to minimize the weight of the bird.

**Shelter**
— provides protection or cover from the weather.

**Shorebird**
— a type of bird that usually frequents coastal or inland shorelines and wetlands.

**Shrubland**
— land covered by short shrubs.

**Similarities**
— characteristics that relate two organisms.

**Song**
— the notes repeated by a bird over and over in a regular pattern. Birds use song to help defend territories and sometimes attract mates.

**Species**
— a population of individuals that are more or less alike and are able to breed and produce fertile offspring under natural conditions.

**Struts**
— located inside the bones of birds to give strength to the bones.

**Survey**
— a study of existing organisms to determine if any relationship exists.

T

**Temperate**
— area of the earth that lies between the tropical and polar regions and has a mild climate.

**Tendon**
— the tough, fibrous tissues which connect the ends of muscles with the bones. The tendon of a bird is used to "lock" the bird on its perch while sleeping. As the bird relaxes and slumps down, the tendon tightens and draws the birds' toes together, which lock the bird on the perch.

**Territory**
— the space a bird defends from other birds (usually of the same species) for mating or feeding.

**Threatened**
— when a species' numbers decline to an alarming rate; a step before endangered.

**Toxic**
— having the effect of a poison.

**Trend**
— the general course of prevailing tendency.

**Tropical rain forest**
— biome of equatorial regions, characterized by heavy rainfall, constant warm temperatures, dense growth of many different tree species.

## U

**Uropygial gland**
— a conical, bilobed structure on the birds rump which produces an oil which is applied to the feathers and claws for waterproofing.

## V

**Vane**
— feathers that consists of a network of barbs and barbules.

**Vegetation**
— general references to the plants that are found within a given area.

## W

**Want**
— to feel a desire for; wish for.

**Warm-blooded**
— being able to maintain a constant body temperature independent of the outside temperature. All birds are warm-blooded.

**Waterfowl**
— a swimming bird, as a duck or goose, usually frequenting freshwater lakes, rivers, ponds, and occasionally saltwater.

**Wetland**
— lands which are transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water.

**Wildlife**
— general term for a group of animals in their natural environments.

**Wingspan**
— the length between the tips of a bird's outstretched wings.

## BOOKS

*Eyewitness Books: Bird.*
Dorling Kindersley Inc.

*Eyewitness Jr: Amazing Birds.*
Dorling Kindersley Inc.

*Mysteries & Marvels: Bird Life.*
EDC.

*Usborne First Nature: Birds.*
EDC.

*Usborne Science & Nature: Ornithology.*
EDC.

*What Hatches From An Egg.*
Dorling Kindersley Inc.

Adler, B.
*Outwitting Squirrels.*
Chicago Review Press. 1988.

Anderson, Lonzo.
*Mr. Biddle and the Birds.*
Charles Scribner's Sons. 1971.

Arnosky, Jim.
*Crinkleroots Guide to Knowing the Birds.*
Bradbury Press.

Atwood, Margaret.
*For the Birds.*
Douglas & McIntyre.

Austin & Austin, Jr.
*The Random House Book of Birds.*
Random House. 1970.

Bantock, Nick.
*Wings.*
Random House.

Barrington, Rupert.
*A Garden for Your Birds.*
Grosset and Dunlap. 1971.

Baylor, Byrd.
*Hawk, I'm Your Brother.*
Macmillan. 1976.

Bellamy, David.
*The Forest.*
Clarkson N. Potter, Inc. 1988.

Bent, A. C.
*Life Histories of North American Birds.*
Dover Publications. 1964.

Bergman, C. A.
*Audubon's Guide to Spotting Scopes.*
Audubon Magazine 88(4): 95 - 109. 1986.

Bondesen, P.
*North American Bird Songs.*
Scandinavian Science Press. 1977.

Boring, Mel.
*Birds, Nests, and Eggs.*
Northwood Press Inc. 1996.

Brauning, Dan; et. al.
*Annotated List of the Birds of Pennsylvania.*
Ornithological Tech. Commitee. 1992.

Brauning, Dan.
*Atlas of Breeding Birds in Pennsylvania.*
University of Pittsburgh Press. 1992.

Buff, Sheila.
*Birding For Beginners.*
Lyons & Burford.

Burton, Robert.
*Bird Migration.*
Eddison Sadd Press. 1992.

## BOOKS

Burton, Robert.
*Bird Migration: An Illustrated Account.*
Facts on File.

Burton, Robert.
*Egg, A Photographic Story of Hatching.*
Dorling Kindersley Inc. 1995.

Collins, H. H. Jr.
*What Bird is This? The Birdwatcher's Quiz Book.*
Dover Publications.

Comstock, A. B.
*Handbook of Nature Study.*
Comstock Publishing Co. 1939.

Cook, B. C.
*Invite a Bird to Dinner: Simple Feeders You Can Make.*
Lothrop, Lee and Shepherd Co. 1978.

Cooper & Eley.
*First Aid and Care of Wild Birds.*
Davis and Charles. 1979.

Cooper, J. E.
*Veterinary Aspects of Captive Birds of Prey.*
Standfast Press. 1981.

Cruishank, Allen & Helen.
*1001 Questions Answered About Birds.*
Dover Publications.

Degraaf & Witman.
*Trees, Shrubs, and Vines For Attracting Birds.*
University of Mass. Press. 1979.

DeGraff & Rappole.
*Neotropic Migratory Birds: Natural History, Distribution, and Population Change.*
Cornell University Press, Sage House. 1995.

Dennis, J. V.
*A Complete Guide to Bird Feeding.*
Alfred A. Knopf. 1982.

Dennis, J. V.
*A Complete Guide to Feeding.*
A. A. Knopf. 1975.

Dennis, J. V.
*Beyond the Bird Feeder.*
A. A. Knopf. 1981.

Dunne, P.
*Binoculars For Birders.*
Living Bird Quarterly 4(1): 16-21. 1985.

Ehlert, Lois.
*Feathers for Lunch.*
Harcourt Brace.

Erlick, P. R.
*The Birder's Handbook.*
Simon and Schuster. 1988.

Esbensen, B. J.
*Tiger With Wings - The Great Horned Owl.*
Orchard Books. 1991.

Finch, D. M.
*Population Ecology, Habitat Requirements, and Conservation of Neotropical...*
UDDA Forest Service Gen. Tech. Report RM 205. 1991.

Finch, D. M. and Stangel, P. W.
*Status and Management of Neotropical Migratory Birds.*
USDA Forest Serv. Gen. Tech. Report. 1993.

Flanagan, G. L.
*Window into a Nest.*
Houghton Mifflin. 1957.

Fleischman, Paul.
*I Am Phoenix: Poems For Two Voices.*
Harper Collins.

Ford, Barbara.
*How Birds Learn to Sing.*
Messner. 1975.

## BOOKS

Forshaw.
*The Nature Company Guide: BIRDING.*
Time-Life Books. 1994.

Forsythe & Aziz.
*Exploring the World of Birds: An Equinox Guide to Avian Life.*
Camden House.

Freedman, Russell.
*How Birds Fly.*
Holiday House. 1977.

Freethy, R.
*How Birds Work.*
Bland for Press. 1982.

Freschet, Bernice.
*Biography of a Buzzard.*
Putnam. 1976.

Garelick, Mary.
*It's About Birds.*
Holt. 1979.

George, J. C.
*The Moon of the Winter Bird.*
Thomas E. Crowell Co. 1969.

Givens, J. E.
*Just Two Wings.*
Atheneum. 1984.

Goins, E. H. & Tveten, J. L.
*Treasures of the Nest.*
McKay. 1978.

Goldin, Augusta.
*Ducks Don't Get Wet.*
Thomas Y. Crowell. 1989.

Gooders, John.
*Practical Ornithologist: What to Look For, How and When to Look For it, and How to...*
Fireside Press.

Goodnow, David.
*How Birds Fly.*
Periwinlkle Books.

Graham, Ada & Frank.
*Jacob and Owl: A Story.*
Coward, McCann and Geoghegan. 1981.

Greenberg & Reaser.
*Bringing Back the Birds.*
Stackpole Books. 1995.

Griffin, D. R.
*Bird Migration.*
Dover Publications. 1974.

Griffin, Steven and Elizabeth.
*Bird Watching For Kids.*
Northwood Press Inc. 1995.

Grubb, T. C.
*Beyond Birding, Field Projects for Inquisitive Birders.*
Boxwood Press. 1986.

Hagan & Johnston.
*Ecology and Conservation of Neotropical Migrant Birds.*
Smithsonian Institution Press. 1992.

Harrison, G. H.
*The Backyard Bird Watcher.*
Simon and Schuster. 1979.

Heintzelman, D. J.
*The Birdwatcher's Activity Book.*
Stackpole Books. 1983.

Henderson, C.
*Landscaping For Wildlife.*
Minnesota Dept. of Natural Resources. 1987.

Hickman, M. & Guy, M.
*Care of the Wild, Feathered, and Furred.*
Oredna-Unity. 1973.

## BOOKS

Hirschi & Burrell.
*What is a Bird?*
Walker Publishing Co.

Hunken, Jorie.
*Birdwatching For All Ages: An Activity Book For Children & Adults.*
Globe Pequot.

Kerlinger, Paul.
*How Birds Migrate.*
Stackpole Books. 1995.

Kindersley, Dorling.
*Birds.*
Eyewitness Books.

Koch, Maryjo.
*Bird, Egg, Feather & Nest.*
Stewart, Tabori & Chang.

Lasky, Kathryn.
*She's Wearing A Bird on Her Head.*
Hyperion Books for Children. 1995.

Laycock, G.
*The Birdwatcher's Bible.*
Doubleday. 1976.

Lentz, J. E. and Young, J.
*Birdwatching, A Guide For Beginners.*
Capra Press. 1985.

Lewis, B. A.
*The Kid's Guide to Social Action.*
Free Spirit Publishing, Inc.

Logsdon, Gene.
*Wildlife in Your Garden.*
Rodale Press. 1983.

Martin & Finch.
*Ecology and Management of Neotropical Migratory Birds.*
Oxford University Press. 1995.

Mason, R. C.
*Picture Primer of Attracting Birds.*
Houghton Mifflin. 1952.

May, Julian.
*Why Birds Migrate.*
Holiday House. 1970.

McCauley, J. R.
*Baby Birds and How They Grow.*
National Geographic Society. 1983.

McClure, H. E.
*Bird Banding.*
Boxwood Press. 1984.

McDermott, Gerald.
*The Raven.*
Scholastic, Inc. 1993.

McElroy and Knopf.
*The Habitat Guide to Birding.*
1974.

McElroy, T. P.
*The New Handbook of Attracting Birds.*
A. A. Knopf. 1975.

McKinley, M.
*How to Attract Birds.*
Ortho Books. 1983.

McNeil, Don.
*The Birdhouse Book: Building Houses, Feeders, and Baths.*
Pacific Search Press. 1979.

Mowery, Marci.
*APATH: Native Plants in the Creation of Backyard, Schoolyard, & Park Habitats.*
Audubon Council of PA. 1995.

Obis.
*"Bird Feeder," "Bird Nests," "Flocking For Food," and "For the Birds."*
Delta Education.

## BOOKS

Pallotta, Jerry.
*Bird Alphabet.*
Charlesbridge Publishing.

Parnall, Peter.
*A Dog's Book of Birds.*
Scribner. 1973.

Parnall, Peter.
*The Daywatchers.*
Macmillan. 1984.

Pasquier, R. F.
*Watching Birds: An Introduction to Ornithology.*
1977.

Patent, D. H.
*Feathers.*
Penguin.

Peet, Bill.
*Farewell To Shady Glade.*
Houghton Mifflin Co. 1966.

Peterson, P. C.
*Birding Areas of Iowa.*
Center Rapids. 1975.

Pettingill, O. S.
*A Guide to Bird Finding West of the Missippi.*
Oxford University Press. 1981.

Pettit, Ted.
*Bird Feeders and Shelters You Can Make.*
Putnam. 1970.

Proctor, Noble.
*Song Birds: How to Attract Them and Identify their Songs (With Cassette Tape).*
Rodale Press.

Rappole, J.
*Nearctic Avian Migrants in the Neotropics: Maps, Appendices, and Bibliography.*
Smithsonian Cons. & Research Center. 1995.

Rappole, J.
*The Ecology of Migrant Birds: A Neotropical Perspective.*
Smithsonian Institution Press. 1995.

Rockwell, Anne.
*Our Yard is Full of Birds.*
Macmillan.

Sadoway, M. W.
*Owls - Hunters of the Night.*
Lerner Publications Co. 1981.

Sawyer, E. J.
*Homes for Wildlife. Baths and Feeding Shelters.*
Cranbrook Institute of Science. 1969.

Schultz, Ellen.
*I Can Read About Birds.*
Troll Associates. 1996.

Sill, Cathryn & John.
*About Birds.*
Peachtree.

Singer, Arthur & Alan.
*State Birds.*
E. P. Dutton.

Sisson, E. A.
*Nature With Children of All Ages.*
Prentice-Hall, Inc. 1982.

Soper, T. & Arbib, R.
*The Hungry Bird Book.*
Taplinger Publishing Co. 1971.

Sorlie & Schinkel.
*Building for Birds.*
Ol' Sam Peabody Co.

Sparks, J.
*Bird Behavior.*
Grossett and Dunlap. 1970.

## BOOKS

Stefferud & Nelson, eds.
*Birds in Our Lives.*
U. S. Government Printing Office. 1966.

Stokes, D. W.
*A Guide to the Behavior of Common Birds.*
Little Brown Co. 1979.

Tekulsky, Matthew.
*The Hummingbird Garden.*
Crown Publishers Inc. 1990.

Terborgh, John.
*Where Have All the Birds Gone?*
Princeton University Press. 1989.

Terres, J. K.
*How Birds Fly.*
Stackpole.

Terres, J. K.
*Songbirds in your Garden.*
Hawthorn Books. 1977.

Terres, J. K.
*The Audubon Society Encyclopedia of North American Birds.*
Random House.

Turner, Ann.
*Heron Street.*
Charlotte Zolotow Book. 1989.

Van Vleck, Sarita.
*Ways of the Bird: A Naturalists Guide to Bird Behavior.*
Lyons & Burford.

Weber, W. J.
*Attracting Birds and Other Wildlife into Your Backyard.*
Holt, Rinehart and Winston. 1982.

Weidensaul, Scott.
*A Kid's First Book of Birdwatching (With Audiocassette).*
Running Press.

Welty, J. C.
*The Life of Birds.*
CBS Publishing. 1982.

Western Regional Env. Ed. Council.
*Project Wild...*
Salina Star Route.

Wexler, J. & Cole, H.
*A Chick Hatches.*
Morrow. 1976.

Witty, Helen & Dick.
*Feed the Birds (With Mesh Bag).*
Workman Publishing Co.

Wolf, Ashley.
*A Year of Birds.*
Dodd, Mead and Co. 1984.

Yolen, Jane.
*Birdwatch.*
Philomel.

Yolen, Jane.
*Owl Moon.*
Philomel Books. 1987.

Zim & Gabrielson.
*Golden Nature guide to the Birds.*
Westrern. 1956.

## NEWSLETTERS, POSTERS, & MISCELLANEOUS

### Audubon Adventures

Newsletter-Bird Migration Issue
$2.00 single issue
$10.00 unit of 30
Contact: Education Division, National Audubon Society
Rt. #4
Sharon CT 06069
203-364-0520

### Backyard Habitat Information Packet

Includes program application, booklet on planning and planting a habitat.

Contact: NWF
1400 Sixteenth St.
Washington D.C. 20036-2266
800-432-6564

### Bird Migration in the Americas

An excellent bird migration map.
Order back issue of National Geographic Magazine, Vol. 156, No. 2, August 1979.

800-548-9797 $ 2.65

### Birds of Two Worlds: Tropical Birds of the Midwest

Poster depicts many of Pennsylvania's neotropical migrants with migration notes on back.

Contact: Missouri Dept. Conservation
Box 180
Jefferson City Mo 65102
314-751-4115

### Children's Alliance for the Protection of the Environment, Inc.-(CAPE)

A non-profit organization promoting education and conservation action programs for children worldwide.

Contact: CAPE International Office
P.O. Box 307
Austin TX 78767
512-476-2273

### Common Feeder Birds Poster

Available for both eastern and western birds.

Contact: Cornell Lab of Ornithology, Crow's Nest Birding Shop.
159 Sapsucker Woods Road
Ithaca NY 14850
607-254-2400

### Disappearing Birds-Disappearing Habitats

Teacher's packet with poster that describes the habitats used by migrating birds.

$10-Poster
$2-Leader's Guide
Contact: Education Division, National Audubon Society
Rt. # 4
Sharon Conn. 06069
203-364-0520

### Disappearing Habitat, Disappearing Birds

Full color poster, includes teacher's guide.

$7 folded: $10.00 unfolded
Contact: National Audubon Society, Education Division
700 Broadway
New York NY 10003-9501
212-979-3000

## NEWSLETTERS, POSTERS, & MISCELLANEOUS

### Early Birders

A nationwide nature club for children who love birds. Members receive weekly postcards on bird facts, and have the opportunity to have their artwork published on the postcards.

Contact: Early Birders
Box 111
Harmony RI 02829-0111
401-728-6309

### Hummingbird Newsletter

A 4-issue newsletter, including catalog on hummingbird educational materials.

Contact: Hummers Inc., Department PF
Box 394
Newark DE 19175
305-455-0505 $10.00/yr.

### Keystone Wild Notes-Fall Issue

Contains pertinent information on PA's neotropical migrants.

Contact: Wild Resource Conservation Fund
P.O. Box 8764
Harrisburg Pa 17105-8764
717-783-1639

### Migration Mysteries: Disappearing Neotropicals and Animal Superheros

These 2-page newsletters for children use games, puzzles, and fun facts to describe the wonders of migration and the problems facing migrants.

Contact: Keith Van Cleave, Minnesota Valley National Wildlife Refuge
3815 E. 80th St.
Bloomington MN 55425

### Migratory Songbird Conservation

Brochure describes "Partners In Flight" and how you can help.

Contact: Dan Petit, USFWS, OMBM
1849 C Street NW, ms 634 ArSq.
Washington D.C. 20240
703-358-1821

### National Geographic Shorebird Migration Map

This popular map protrays routes between breeding and wintering grounds. Produced by the National Geographic Society.

Contact: American Birding Association
-A small donation is requested to cover the cost of shipping.

P.O. Box 6599
Colorado Springs Co 80934
719-578-9703 free

### No Place To Land

1994 poster insert in Audubon Magazine(Nov-Dec). Depicts 21 species of NTMB's, their status and causes for concern.

Contact: NAS, Mid-Atlantic Regional Office
1104 Fernwood Ave., Suite #300
Camp Hill Pa 17011
717-763-4985 $3.00

### Oklahoma's Rainforest Connection

Folded full color poster featuring Oklahoma's Neotropical Migrants.

Contact: Non-game Dept.
1801 N. Lincoln Blvd.
Oklahoma City Ok 73105
405-521-4616 Free

## NEWSLETTERS, POSTERS, & MISCELLANEOUS

### Protect Our Uncommon Wealth: Neotropical Migrants

Full color poster portraying some of PA's neotropical migratory birds and their habitats.

Contact: Wild Resource Conservation Fund
P.O. Box 8764
Harrisburg Pa 17105-8764
717-783-1639

### Smithsonian Migratory Bird Center Fact Sheet Series

Informational series on issues critical to migratory bird conservation.

Contact: SMBC, The National Zoo
Washington D.C. 20008
Free

### The Nature Conservancy Nature Cards: Birds

32 cards of color photographs.
Contact: Houghton Mifflin Co.
ISBN: 0-395-64350-3
$9.00

### Will We Lose Our Songbirds?

General information on Partners In Flight.
Free individual orders.- $.22 each for orders over 25.
Contact: "Songbird Brochure", NFWF
1120 Connecticut Ave. NW, Suite 900
Washington D.C. 20240
202-857-0166

### Ranger Rick's Nature Scope - Birds, Birds, Birds!

One publication in a creative education series dedicated to inspiring a child's understanding and appreciation of the natural world.

Contact: Nature Scope, National Wildlife Federation
1400 Sixteenth St. NW
Washington D.C. 20036-2266
800-432-6564

### Songbirds of Forest and Field

Full color poster featuring eleven migrants by Louis Agassiz Fuertes

Reference # 024-010-00699-4
Contact: Superintendent of Documents
U.S. Government Printing Office
Washington D.C. 20402-9325
$6.50

### Wild Bird Center or Wild Bird Crossing Store Information Flyers

Desinging Your Feeding Station, Attracting Birds with Water, and Bird Feeding Preferences are available through each store.

Contact: Wild Bird Centers
7370 MacArthur Boulevard
Glen Echo MD 20812
800-WILDBIRD

### Will We Lose Our Songbirds? Migratory Songbird Conservation, Backyard Bird Problems, Homes for Birds.

Free brochures and other publications.
Contact: U.S. Fish and Wildlife Service,
Publications Unit.
4401 North Fairfax Drive, Room 130
Arlington Va 22203

## FIELD GUIDE

**A Field Guide to Birds' Nests in the Eastern U.S.-(1979)**

Hal H. Harrison
Houghton Mifflin

**A Field Guide to Birds' Nests in the Western U.S.-(1979)**

Hal H. Harrison
Houghton Mifflin

**A Field Guide to the Nests, Eggs, and Nestlings of North American**

Colin Harrison
Collins-Cleveland

**A Field Guide to Western Birds-(1990)**

Roger Tory Peterson
Houghton-Mifflin Co.

**Audubon Society Field Guide to North American Birds: Eastern (1985)**

John Bull and John Farrand, Jr.
Alfred A Knopf
0-394-41405-5 $18.00

**Audubon Society Master Guide to Birding-Volume 1: Loons to Sandpipers**

0-394-53382-8 $16.95

**Audubon Society Master Guide to Birding-Volume 2: Gulls to Dippers**

0-394-53384-4 $16.95

**Audubon Society Master Guide to Birding-Volume 3: Old World Warblers to**

0-394-53383-6 $16.95

**Birds At A Glance-(1959)**

L. Blachly and R. Jenks
Van Nostrand Reinhold Co.

**Birds of Missouri-(1992)**

C.S. Robbins and D.A. Easterla
University Missouri Press

**Birds of North America-(1983)**

C.S. Robbins, B. Brunn, and H.S. Zim
Golden Press - New York, New York

**Eastern Birds. An Audubon Handbook-(1988)**

John Farrand Jr.
McGraw-Hill Book Co.

## FIELD GUIDE

**Field Guide to the Birds of North America-(1983)**

J. Dunn and E.A.J. Blom

**How to Identify Birds-(1988)**

John Farrand Jr.

Alfred A. Knopf

**Peterson Field Guide to Birds East of the Rockies**

Paperback / hardcover / flexibound

0-395-26619-X $15.95 / 21.95 / 16.95

**Peterson Field Guide To Hawks**

Paperback / Hardcover

0-395-441112-9 $13.95 / 19.95

**Stokes Nature Guide To Bird Behavior: Volume 1, 2, 3**

Donald & Lillian Stokes

A three volume set that provides a behvavior calendar, display guide and behavior descriptions for 25 of the more common birds of North America.

0-316-81725-2 $12.95

**The Audubon Society Field Guide to North American Birds, Western Region-(1977)**

J. Bull and L. Farrand Jr.

Alfred A. Knopf

**Golden Guide to Field Identification: Birds of North America**

0-307-13661-2 $12.00

**Peterson Field Guide to Advanced Birding**

Paperback / Hardcover

0-395-53376-7 $14.95 / 22.95

**Peterson Field Guide to Birds' Nests-Eastern**

Paperback / Hardcover

0-395-48366-9 $13.95 / 18.95

**Peterson First Guide To The Birds**

A good guide for the beginner of any age or even for the pocket of a more experienced birder.

0-395-40684-6 $4.95

**The Audubon Society Encyclopedia of North Amercian Birds-(1980)**

J.K. Terres

Alfred A. Knopf

**The Audubon Society Guide to Attracting Birds-(1985)**

Stephen W. Kress

Charles Scribner's Sons

## COMPUTER SOFTWARE

### Backyard Birds

A discovery-learning simulation that capitalizes on the natural curiosity of students and encourages them to use their curiosity while developing scientific and thinking skills.

### Birding on the Web

www.zender.com/birder

### Global Rivers Environmental

www.igc.apc.org/green

### Journey North

This program allows students access to wildlife migration via the Internet.

Contact: Journey North, 125 North Street.
Minneapolis, Minn 55401

http://www.learner.org/k12

### Migratory Bird Center Home Page

Check out the site on the World Wide Web at: www.si.edu/natzoo/zooview/smbc/smbchome.htm

### National Audubon Society

Illuminating data about more than 700 species of birds. Contains more than 2100 color digital images, and allows user to identify species by size, shape, color, seasonal location, and habitat.

Contact: Nat. Audubon Society - number listed below. - Dept. # 04251

### Birder Home Page

www.birder.com

### Econet: Institute for Global

www.igc.apc.org

### Herpetology-World Wide Web

www.crystal.harvard.edu:8000/herp

### Marine Mammals

www.oregoncoast.com/whales.htm

### National Audubon Society Home

www.audubon.org/audubon

### National Fish And Wildlife

Check out the latest conservation initiatives online.

http://www.nfwf.org

## COMPUTER SOFTWARE

### National Wildflower Research

www.Instar.com/wildflower

### The Virtual Birder: The Internet

www.virtualbirder.com

### Weeds to Trees

A discovery-learning simulation that capitalizes on the natural curiosity of students and encourages them to use their curiosity while developing scientific process and thinking skills.

### Project WILD

Offers information on the interdisciplinary, supplementary conservation and environmental education program.

Contact: Project WILD
5430 Grosvenor Lane, Bethesda, MD 20814

http://eelink.umich.edu/wild/.

### The Wild Ones: Wildlife

www.columbia.edu/cu/cerc/WildOnes

## EDUCATIONAL RESOURCES

### Audubon Adventures

For elementary school classes and other groups of children ages 3-6. Issued bi-monthly, it contains the Audubon Adventures newspaper, activity ideas, and membership cards.

Contact your local Audubon Chapter, or
National Audubon Society

613 Riversville Rd.
Greenwich Conn. 06831

203-869-5272

### Audubon Birdfeeders

Full color catalog with over 20 different birdfeeders and other accessories.

800-252-5696

### Birds Over Troubled Forest

Colorful booklet introducing the reader to migratory birds through lively descriptions.

Contact: National Zoo
Washington D.C. 20008

$5.00

### Common Ground Distributors

Nature and the environment for children and adults.
-Books, audio, video, CD-Rom.

370 Airport Rd.
Arden NC 28704

800-654-0626

### Earth Foundation

Focus is on education, fundraising for conservation, and cooperative programs with conservation groups and indigenous organizations.

Contact: Earth Foundation
5151 Mitchelldale, Suite B-11
Houston TX 77092

713-686-9453

### Feathered Travelers: Neotropical Migratory Birds of the Americas

Educational reading and coloring book about bird migration and basic ecology, natural history, and conservation. Includes list of contacts where more information can be attained. (English and Spanish)

Contact: Smithsonian Migratory Bird Center

National Zoo
Washington D.C. 20008

$8.00 each

### Federal Junior Duck Stamp Conservation Program

Students work to design a duck stamp to be bought by duck hunters and stamp collectors, with revenue directed toward the preservation of waterfowl habitat in the U.S.

Contact: Federal Duck Stamp Program, U.S. Fish and Wildlife Service

1849 C Street, NW
Washington D.C. 20240

202-208-4354

### Fun Facts About Purple Martins

The organization functions as a centralized data gathering and information source on the species. It's major mission is educating martin enthuiasts in the proper techniques for managing this human-dependant species.

Contact: Purple Martin Conservation Association
Edinboro University of Pennsylvania

Edinboro PA 16444

## EDUCATIONAL RESOURCES

### International Crane Foundation

The foundation offers numerous curriculum packets including coloring books, activity booklets, study sheets, slide shows and more. Posters, books, pictures, and films also available.

Contact: International Crane Foundation

E-11376 Shady Lane Rd., P.O. Box 447

Baraboo WI 53913-0447

608-356-9462

### Migration Mysteries: Disappearing Neotropicals and Animal Superheroes

Two 4-page newsletters for children use games, puzzles, and fun facts to describe the wonders of migration and the problems facing migrants.

Contact: Keith Van Cleave, Minnesota Valley National Wildlife Refuge

3815 E. 80th St.

Bloomington MN 55425

### Partners In Flight Citizen's Guide

Provides detailed information on the concerns and problems of Neotropical Migratory Birds; guidelines for protecting migratory bird habitat; actions you can take from your desk to the field, and more.

Contact: The Cornell Lab of Ornithology
$ 5 each or $2 each for orders of five or more

159 Sapsucker Woods Rd.

Ithaca NY 14850

### Project Feederwatch

A November through March project that involves counting feeder birds. Participants recieve quarterly reports in the newsletter, BirdScope.

Contact: Cornell Lab of Ornithology

159 Sapsucker Woods Rd.

Ithaca NY 14850

800-843-BIRD $15.00 Annually

### Learning About our Backyard Birds

Filled with fun, informative activities about ecology and conservation, as well as math, science, and reading.

Contact: Send check or money order to the National Bird Feeding Society

P.O. Box 23

Northbrook IL. 60065

$ 8.00

### Neotropical Migrant Literature from Selected States

A compilation of 16 articles on neotropical migrants from states east of the Mississippi River.

Contact: PW Coordinator, PA Game Commission, Bureau of Information & Education

2001 Elmerton Ave.

Harrisburg Pa 17110-9797

FREE

### Project Aves

Feeder studies, nesting studies, and neotropical bird study. Children throughout the Western Hemisphere will be linked via telecommunication.

Contact: Todd Culver, Cornell Lab of Ornithology, Education Specialist

159 Sapsucker Woods Rd.

Ithaca NY 14850

607-254-2403

### Project WILD

An interdisciplinary, supplementary conservation and environmental education program emphasizing wildlife. Offers educator training workshops in every state.

Contact: Project Wild in PA
2001 Elmerton Ave
Harrisburg, PA 17110
717-783-4872

Project Wild National
707 Conservation Lane
Gaithersburg, MD 20878

## EDUCATIONAL RESOURCES

### Shorebird Migration Game

Booklet includes lesson plans and game rules.

Contact: Education Coordinator, Manomet Observatory.
Box 1770
Manomet Mass. 02345

508-224-6521 $24.00

### The Acorn Naturalist

Books and supplies for science and environmental education.

17300 E. 17th St., J236
Tustin Ca 92680

800-422-8886

### The Vanishing Forest--The Crisis of Tropical Deforestation

In-depth filmstrip that tells the story of tropical rainforests, the threats they face, and efforts to save them.

Filmstrip, cassette, and illustratted guide.

P.O. Box 52
Madison WI 53701

800-356-2303

### Songbird Blues Trunk

Comprehensive curriculum for elementary school students

Contact: Montana Natural History Center
P.O. Box 8514
Missoula MT 59807

Rent-$20/3 wk.

### The Songbird Connection

Multidisciplinary lessons for grades K-12.

Contact: New Jersey Conservation Foundation
300 Medham Road
Morristown NJ 07690

201-539-7540 $50.00

## VOLUNTEER ACTIVITIES

### Bird Banding Projects

Volounteers can help remove birds from mist nets and observe the birds being processed, while improving bird identification skills.

Contact: Colorado Bird Observatory

### Breeding Bird Survey

Takes place each June. Experienced volunteers, familiar with all bird songs in their area, count birds on predetermined twenty-five mile routes along secondary roads.

### Citizen's Guide to Migratory Bird Conservation

Contact: Cornell Lab of Ornithology
159 Sapsucker Woods Rd
Ithaca NY 14850
607-254-2440 $5.00

### North American Migration Count

Conducted on the second Saturday in May each year. Participation by birders of all skill levels is encouraged.

Contact: Jim Stasz, North American Migration Count
P.O. Box 71
North Beach Md. 20714

### Project Feederwatch and Project Pigeon Watch

Fun programs for students to collect information used by scientists.

Contact: Cornell Lab of Ornithology
159 Sapsucker Woods Rd.
Ithaca NY 14850
607-254-2473

### Breeding Bird Census and Winter Bird Population Study

Intensive surveys involving eight morning visits to specific areas to measure the density of birds in various habitats across North America.

Contact: Cornell Labratory of Ornithology
159 Sapsucker Woods Road
Ihtaca NY 14850

### Christmas Bird Count

Birds are counted by various birding groups at hundreds of locations throughout the U.S. and Canada between Dec. 20 and Jan. 3. A great chance for novices to learn a lot about birds.

Contact: Audubon Council of Pennsylvania
1104 Fernwood Ave., Suite #300
Camp Hill Pa. 17011
717-763-4985

### Guide to Volunteer Opportunities

Booklet lists projects in which volunteers can gain experience in migratory bird monitoring, habitat restoration and education.

Contact: American Birding Association
P.O. Box 6599
Colorado Springs Co 80934
719-578-9703 $2.00 each

### North American Nest Record Card Program (NRCP)

Volunteers record nesting data, such as nest location, species, date of observation, clutch size, and young, on cards provided by Cornell Univ.

Contact: Cornell Labratory of Ornithology
159 Sapsucker Woods Road
Ithaca NY 14850

### Project Tanager

Study to determine the size of forest patches required for breeding of Tanagers. Participants select census points in forests of different sizes and visit the site twice a year to count Tanagers.

Contact: Cornell Labratory of Ornithology
159 Sapsucker Woods Road
Ithaca NY 14850

## PERIODICALS & JOURNALS

### Audubon

$ 20/yr. - published every two months

Contact: National Audubon Society, 700 Broadway,
New York, NY 10003
(800)-274-4201

### Birder's World

$25/yr. - published bi-monthly

Contact: Kalmbach Publishing Company, 21027
Crossroads Circle, P.O. Box 1612 Waukesha, WI
53187

### Field Notes

$25/yr. - published 4 times a year

Contact: National Audubon Society, 700 Broadway,
New York, NY 10003
(212)-979-3000

### P3, The Earth-based Magazine for Kids

Environmental magazine printed on recycled paper and written for children.

$12/1 yr. or $20/2 yrs. - All orders must be acccompanied by a check made out to P3 Magazine

### The Condor

Published quarterly by the Coopers Ornithological Society.

### The Wilson Bulletin

Published quarterly by the Wilson Ornithological Society.

Contact: Wilson Ornithological Society, Museum of
Zoology, University of Michigan, Ann Arbor, MI
48104

### Bird Watchers Digest

$18.95/yr. - published bi-monthly

Contact: Pardson Corporation, P.O. Box 110,
Marietta, Ohio 45750-0110

### Birding

$35/yr. - published bi-monthly

Contact: American Birding Association
4 Swallow Drive, Colorado Springs, CO
80904

### Hawk Mountain News

Contact: Hawk Mountain Sanctuary Associaion -
(610)-756-6961

### The Auk

Published quarterly by the American Ornithololgists' Union.

Contact: The American Ornithologists' Union, Nat'l.
Museum of Natural History, Smithsonian Inst.,
Wash., D.C. 20560

### The Living Bird Quarterly

Published quarterly by the Cornell Lab of Ornithology.

Contact: Cornell Lab of Ornithology, 159
Sapsucker Woods Rd., Ithaca, NY 14850

### Wildbird Magazine

March 1995 issue devoted to neotropical migratory birds.

Contact: Wildbird Back Issues
Box 6050
Mission Viejo, Ca 92690

## AUDIO & VIDEO

### Attracting Birds to Your Backyard, with R.T. Peterson.

60 minute video.
VHS

Nature Science Network

9999-00062-2 $30.00

### Audubon Society's Videoguide To The Birds Of North America: Volume 1, Loons-Gamebirds

Five volumes cover all birds in this video version of a field guide, pointing out distinctive field marks, using animation along with still and motion picture footage. ---VHS

Nature Science Network

1-55919-075-2 $29.95

### Audubon Society's Videoguide To The Birds Of North America: Volume 2, Waterbirds.

Five volumes cover all birds in this video version of a field guide, pointing out distinctive field marks, using animation along with still and motion picture footage.---VHS

Nature Science Network

1-55919-076-0 $29.95

### Audubon Society's Videoguide To The Birds Of North America: Volume 3, Alcids-Woodpeckers.

Five volumes cover all birds in this video version of a field guide, pointing out distinctive field marks, using animation, along with still and motion picture footage. ---VHS.

Nature Science Network

1-55919-077-9 $29.95

### Audubon Society's Videoguide To The Birds Of North America: Volume 4, Flycatchers-Vireos

Five volumes cover all birds in this video version of a field guide, pointing out distinctive field marks, using animation along with still and motion picture footage.---VHS

Nature Science Network

1-55919-078-7 $29.95

### Audubon Society's Videoguide To The Birds of North America: Volume 5, Warblers-Finches

Five volumes cover all birds in this video version of a field guide, pointing out distinctive field marks, using animation along with still and motion picture footage.---VHS.

Nature Science Network

1-55919-079-5 $29.95

### Backyard Bird Walk

This unique beginner's guide introduces 24 species of common backyard birds. Cassette & 28 page booklet.

NatureSound Studio

1-878194-07-0 $12.95

### Birds In the Balance

A 15-minute slideshow describing the conservation, biology, and plight of NTMB's. Good for a younger audience or as introduction to NTMB's.

$25.00

### Birds of The Backyard: Winter into Spring

An uncommon video adventure with the common birds of the backyard - winter into spring. At the end of narration, the lovely images and natural sounds are repeated without narration. ---VHS

Comany for Home Entertainment

none $29.95

### Cornell Lab of Ornithology Visual Services

Catalogue of color slides of all North American Birds.

## AUDIO & VIDEO

### How to Start Watching Birds - Your Lifetime Ticket to the Theater of Nature.

90 minute video for beginner birding.
- VHS

Ideaform, Inc.

0-934077-17-7 $30.00

### Know Your Bird Sounds - Volume 2

Recordings feature 36 birds on each of two volumes. Volume 2 covers birds of the countryside.
----CASSETTE or CD

NatureSound Studio

1-878194-02-X $12.95 / 18.95

### Never A Silent Spring: Neotropical Migratory Bird Conservation

For more information on this 10 minute video contact U.S. Fish and Wildlife Service, Office of Public Affairs.

### Peterson Field Guide: Backyard Bird Song

Inroduces the listener to the distinctive calls and songs of the most familiar birds, with narration telling how to distinguish one species from another. ---CASSETTE

Houghton Mifflin Co.

0-395-58416-7 $19.95

### Peterson Field Guide: Eastern Bird Songs.

Intended to accompany the classic Peterson Field Guide, it covers all the common species, and includes a booklet to locate each species on the recording.--- 1 CD

Houghton Mifflin Co.

0-395-50257-8 $39.95

### Know Your Bird Sounds. - Volume 1

Recordings feature 36 birds on each of two volumes. Volume 1 is yard, garden, and city birds.
--CASSETTE or CD

NatureSound Studio

1-878194-01-1 $12.95 / 18.95

### National Audubon Society A/V Selection

Large selection of videos, films, and slideshows on birds and the environment. RENTALS are free to Audubon Chapters, all others $10/video or $25/slide program or film.
Contact: National Audubon Society, 1104 Fernwood Ave.
Camp Hill, PA 17011

(717)-763-4985

### Partners in Flight Slide Show

13 minutes, 60 slides with script and cassette tape depicting the plight of Neotropical migrants and what Partners in Flight is doing to help.

Cornell Lab of Ornith., Visual Services

### Peterson Field Guide: Eastern Bird Songs.

Intended to accompany the classic Peterson Field Guide, it covers all the common species, and includes a booklet to locate each species on the recording. ---- 2 CASSETTES

Houghton Mifflin Co.

0-395-53150-0 $25.00

### Project Wild- Exploring School Nature Areas

A 13 minute video designed to inspire students and educators to take positive action for the environment.

$16+$3 S&H

## AUDIO & VIDEO

### Series: Bluebirds Up Close; Hummingbirds Up Close; Cardinals Up Close

50 minute videos.
- VHS

Nature Science Network

$30.00 each

### Songbird Story Video

15 minutes. Animated dream in which two children migrate with the birds to learn that declines in migratory birds is a complex problem, and that they must act quickly to help.

Bullfrog Films, Inc.

1-56029-554-6

### Spring and Summer Songbirds of the Backyard.

Sequel to Birds of the Backyard with the same layout, but for the other seasons.
--VHS

Company for Home Entertainment

none $29.95

### Singing In The Rainforest, For The Birds-Comeback Of The Peregrine Falcon, Birders Of A Feather,....

Four videotapes suitable for upper school students to adults. $26.95 each for individual use, $49.95 included public performance rights for use by educators

### Songbird Symphony

Songbird calls with ambient music available on cassette ($9.95) or CD ($15.95)

### VIREO (Visual Resources for Ornithology)

The world's most comprehensive collection of bird photographs, has over 85,000 slides and a smaller number of black and white prints of birds representing over 5,500 species.

## WILDLIFE REHABILITATORS

### ALLEGHENY COUNTY:

Lois Sakolsky
221 Parker Drive
Pittsburgh, PA 15216
412-343-3819

### BRADFORD COUNTY:

Kim Horne
R.R. 1, Box 572
Warren Center, PA 18851
717-395-3389

### BUCKS COUNTY:

Mary J. Stretch
The Aark Foundation
107 Twining Bridge Road
Newtown, PA 18940
215-968-4963

### CENTRE COUNTY:

Susan L. Pochyba
R.R. 2, Box 310
Centre Hall, PA 16828
814-364-2829

### CLARION COUNTY:

Rebecca M. McDonald
R.R. 2, Box 200
Shippenville, PA 16254
814-226-9192

### FAYETTE COUNTY (CONTINUED):

Beth Shoaf and Cindy Cook
Wildlife Works, Inc.
P.O. Box 435
Indian Head, PA 15446
412-925-6862

### COLUMBIA COUNTY:

Nancy P. Crissman
R.R. 9, Box 223
Bloomsburg, PA 17815
717-458-4462

### CRAWFORD COUNTY:

Sue Dearment
Tamarak Wildlife Rehabilitation Center
(serves 15 counties)
21601 Stull Road
Saegertown, PA 16433
814-763-2574

### DAUPHIN COUNTY:

John and Beth Carricato
Dauphin County Wildlife Rescue
699 Knight Road
Harrisburg, PA 17111
717-566-2613

### ERIE COUNTY:

Wendy Campbell
503 West Ninth Street
Erie, PA 16502
814-763-2574

### FAYETTE COUNTY:

Cynthia L. Cook
R.R. 1, Box 259A
Normalville, PA 15469
412-455-7356

### SCHUYLKILL COUNTY:

Peggy Sue Hentz
Red Creek Wildlife Center
300 Moon Hill Drive
Schuylkill Haven, PA 17972
717-739-4393

### LYCOMING COUNTY:

Tink and Ed Reish
Farragut Wildlife Rehabilitation Center
R.D. 4, Box 375
Montoursville, PA 17754
717-435-5906

### NORTHAMPTON COUNTY:

Hope Anwyll
Pennsylvania Raptor and Wildlife Center
7 Allegheny Road
Mt. Bethel, PA 18343
717-897-6659

### PHILADELPHIA COUNTY:

Comoroa Kriszat
Squirrel Haven Second Chance Wild Hospital
12638 Friar Place
Philadelphia, PA 19154
215-637-2067

Patricia O'Connell
Schuylkill Center for Wildlife Rehabilitation
300 Port Royal Avenue
Philadelphia, PA 19128
215-482-8217

### PIKE COUNTY:

William Streeter
Delaware Valley Raptor Center, Inc.
HC77, Box 243
Milford, PA 18337
717-296-6025

### YORK COUNTY:

Michelle E. Eaton
York Wildcare
R.R. 12, Box 352
York, PA 17406
717-757-4420

Barbara Gregory

515 Sipe Road
York Haven, PA 17370
717-938-4040

Wendy Looker
Rehabitat, Inc. (Raptors only)
1815 Pennsylvania Avenue
Dillsburg, PA 17019
717-432-9483

# WINGS ACROSS PENNSYLVANIA:
# *CONNECTING SONGBIRDS AND HABITAT*
## A Jeopardy Game

| | SONGBIRDS | BIRD IDENTIFICATION | HABITAT | MIGRATION | RESEARCH | BIRDS AND PEOPLE | TAKING ACTION | BIRD BIOLOGY |
|---|---|---|---|---|---|---|---|---|
| 10 | Name at least two characteristics that make a bird, a bird. | When identifying a bird, give three examples of what to look for. | What is habitat? | Do all birds in Pennsylvania migrate? | What is ornithology? | Earlier in history, certain birds were almost extinct because of a certain fashion that women liked to wear. What was it? | Describe a positive action that would help bluebirds. | Name the three types of feathers found on a bird. |
| 20 | What is an adaptation? | Give two reasons why birds sing. | Name the four components of habitat. | What flyway or migration pathway do birds from Pennsylvania use? | Name a famous ornithologist. | Today, what are people doing to cause declining numbers of certain birds? | Give an example of a positive action that you can do on your school grounds to help wildlife, especially birds. | Where is a bird's ears located? |
| 30 | Name two adaptations that allow birds to survive in their environment. | Give the memory phase of a songbird's song and the name of its singer. | Why is it important to understand the specific habitat requirements of wildlife? | Give one reason why certain birds such as warblers and scarlet tanagers migrate from North America to South America every year. | Name two of the three scientific investigations that allow us to know more about birds and bird populations. | Name two birds that are not native to our area. | Describe one change you can make in the way you live that would help birds. | Of the five senses, which one is poorly developed in birds? |
| 40 | What two characteristics are used in classifying songbirds? | What TYPE of nest to most songbirds make? | List four different types of habitat in Pennsylvania. | Name at least two obstacles that migrating birds face. | What method would a researcher use to determine where certain birds go and how long they live? | How are introduced species like the starling and house sparrow harmful to native species like the eastern bluebird? | What type of sunflower seed is better for feeding birds, striped or black oil? | What does the gizzard do for birds? |
| 50 | Describe how a bird's voice box (syrinx) is different from that of a person's voice box (larynx). | Name at least two important considerations when identifying a bird. | Describe the habitat for the following three songbirds: goldfinch, scarlet tanager, red-winged blackbird. | How do birds find their way from Pennsylvania to countries in South America? (Name at least one method.) | Give one reason why research on birds and other wildlife is important. | Describe the effects the pesticide DDT had on the food web. | What is a environmental ethic? | Bird feet help a bird survive and find food in its proper habitat. Describe the foot and function of a woodpecker and a robin. |

# WINGS ACROSS PENNSYLVANIA:
## *CONNECTING SONGBIRDS AND HABITAT*
### A Jeopardy Game

| | SONGBIRDS | BIRD IDENTIFICATION | HABITAT | MIGRATION | RESEARCH | BIRDS AND PEOPLE | TAKING ACTION | BIRD BIOLOGY |
|---|---|---|---|---|---|---|---|---|
| 10 | Feathers, wings, beaks, four-chambered heart, some hollow bones. | Size, field marks, flight, sound, behavior, habitat and season. | Where a plant or animal lives. It is the "home address" for that creature. | No, some such as chickadees and cardinals, are year round residents. | The study of birds. | Adorning their hats with feathers, wings and sometimes entire birds. | Identify proper bluebird habitat and erect boxes for nesting birds. | Flight; contour; down. |
| 20 | A physical or behavioral feature of a plant or animal that gives it an advantage in meeting its needs for survival and reproduction. | Courtship and to establish territory. | Food, water, shelter and space. | The Atlantic Flyway. | John James Audubon and Alexander Wilson. | Destruction and/or changing habitat, pollution, pesticides, introduction of exotic species. | Plant native trees, shrubs and wildflowers. Set up a feeding station. | On each side of the head--below and in back of the eyes and covered with feathers. |
| 30 | Specialized beaks and feet. Camouflage, body shape and certain types of behavior also aid in survival. | See *Dawn Chorus* activity (Chapter 3, Lesson 4). Examples: tufted titmouse--"Peter-Peter," rufous-sided towhee--"drink your tea." | So we can plan and manage our neighborhoods, farms and parks and public lands to best meet the needs of wildlife and people. | Large numbers of insects found in North America in summer, along with longer days allows birds to raise more young. | Inventory, monitoring and research. | Starling; house sparrow; house find; brown-headed cowbird. | See Chapter 7, Lesson 5 for a list of ideas. | Smell and probably taste. |
| 40 | Perching (three toes in front, one in back) and a highly developed syrinx or voice box. | An open or cup-shaped nest. | Mixed deciduous forest, forest edge, field, wetlands, ponds, streams and rivers, neighborhoods. | Severe weather, lack of food, destruction of habitat, human harassment and cats. | Bird banding. | Compete for food and nesting areas. | Black oil. | Grinds and crushes hard nuts, seeds, grain and other foods. |
| 50 | Instead of vocal cords, birds have a syrinx (a stretchy muscle that vibrates) located in the lower end of the windpipe. It splits into two and allows two different sounds. People have a larynx located high in the throat. It vibrates when a person breathes and passes air over the vocal cords. | Song, habitat, nest type and location (if seen), and observation of field marks on bird. | Goldfinch-fields, scarlet tanager-forests, red-winged blackbird-wetlands. | Land forms (mountains, oceans), sun, stars and magnetic field. | Provides general knowledge of birds; helps in managing and conserving birds and their habitat; acts as an indicator of the health of our environment. | As it went up the food chain, it concentrated in eagles, hawks and pelicans that ate the fish, killing them or making eggshells so think they couldn't hatch. | A person's morals and values that reflect a positive behavior towards our natural resources. | Woodpecker--climber, two toes in front and two toes in back. Robin--percher, three toes in front and one long toe behind. |

## THE TEACHER'S ROLE IN DEALING WITH A CONTROVERSIAL ISSUE

- Teach students how to raise questions that clarify the important positions in a controversy.
- Be as politically and religiously neutral as possible on certain value-sensitive issues.
- Identify value-laden language to detect built-in biases in materials.
- Distinguish between fact and opinion when analyzing issues, and help students distinguish between the two.
- Teach citizenship skills such as critical thinking, listening, decision-making and problem-solving as well as loyalty to democratic principles.
- Strive to achieve a balance between individual freedoms and social good.
- Encourage students to take positions on issues that are different from the ones they currently hold, in order to expand their understanding of an issue.
- Attempt to anticipate the controversial issues in the curriculum and inform parents about how the issues will be treated before they are introduced.
- Outline a strategy to increase the trust levels between school staff, parents, and the rest of the community.
- Request staff development sessions dealing with the teaching of controversial issues and value education.
- If criticized for teaching a controversial issue, do not respond defensively or with anger. Enter into a dialogue with critics and encourage rational discussions.
- The goal of the school in a particular community must be clear. Is its main goal to change society in certain ways, to reflect predominant values and pass them onto youth, or both?
- Be clear about the alternative positions that will be presented in dealing with a controversial issue.
- Be clear about the community values held by the power structure and be cautious when advocating opposite ones.
- Determine whether or not a specific issue is appropriate for a particular grade level.
- Determine whether or not enough information can be gathered on the various points of view related to an issue.
- Work to develop a climate of trust, respect, and openness to free inquiry in the classroom.

Adapted with permission from:
Wyoming Wetland Wildlife Teaching Package, C.E. Knapp.

# BIRDS FROM JOHN JAMES AUDUBON'S *BIRDS OF AMERICA* NOW EXTINCT, THREATENED OR ENDANGERED

## Extinct in Pennsylvania:

Carolina parrot (parakeet), *Conuropsis carolinensis*
Passenger pigeon, *Ectopistes migratorius*

## Extinct elsewhere:

Great auk, *Pinguinus impennis*
Ivory-billed woodpecker, *Campephilius principalis*

## Threatened and Endangered in Pennsylvania:

American bittern, *Botaurus lentiginosus* — Threatened
Bald eagle, *Haliaeeus leucocephalus* — Endangered
Black tern, *Childonias niger* — Endangered
Great egret, *Casmerodius albus* — Threatened
King rail, *Rallus elegans* — Endangered
Least bittern, *Ixobrychus exilus* — Threatened
Loggerhead shrike, *Lanius ludovicinus* — Endangered
Osprey, *Pandion haliaetus* — Endangered
Peregrine falcon, *Falco peregrinus* — Endangered
Sedge wren, *Cistothorus platensis* — Threatened
Short-eared owl, *Asio flammeus* — Endangered
Upland sandpiper, *Bartramia lognicauda* — Threatened
Yellow-bellied flycatcher, *Empidonax flaviventris* — Threatened
Yellow-crowned night heron, *Nycticorax violaceus* — Threatened

**Compiled by:**
Linda Boice and Allan Gehret, Audubon Wildlife Sanctuary, Mill Grove, Audubon, PA

## SOME PENNSYLVANIA BIRDS

| MIGRATORY SONGBIRDS | |
|---|---|
| Eastern Bluebird<br>(winters in S. United States) | **Habitat**: open country, orchards, farms, backyards, parks<br>**Nests:** nests of grass or pine needles in cavity<br>**Eggs:** pale blue to white; 2-6 in a clutch<br>**Food:** insects, earthworms; (in fall- fruits of cedar, sumac, grape and pokeweed) (usually migrates in winter but at times will stay and feed at feeders-raisins, mealworms, peanut butter with cornmeal) |
| Red-winged Blackbird<br>(winters in S. United States) | **Habitat**: marshes, wet fields, hayfields<br>**Nests:** nests in trees, shrubs, grasses or among cattails and rushes- nests made of coarse grasses and reeds, lined with rootlets and fine grasses<br>**Eggs:** pale blue with dark markings; 3-5 in a clutch<br>**Food**: mostly vegetation; some insect; weed seeds, waste grains, mayflies, caddisflies, caterpillars, grubs, grasshoppers, blackberries, blueberries, other fruit. |
| Gray Catbird<br>(winters in S. United States<br>some south to Mexico and Panama) | **Habitat**: dense thickets along roadsides, forest edges, backyards<br>**Nests:** usually less than 6 ft. high in thicket- made of twigs and leaves lined with bark and rootlets<br>**Eggs:** glossy, dark greenish-blue, 2-6 in a clutch<br>**Food:** grasshoppers, crickets, beetles, caterpillars, and other insects; fruits such as blackberries, grapes,poke berries,--at feeders mealworms and raisins |
| Common Grackle<br>(winters in southern United States) | **Habitat**: farmland, marshes, towns,parks<br>**Nests:** singly or in colonies in evergreens or willows- nests are bulk; made of grasses and mud, lined with find grasses<br>**Eggs:** pale green or brown with dark markings; 4-5 in a clutch<br>**Food**: earthworms, beetles, caterpillars, cicadas, flies, salamanders, mice, eggs, acorns, seeds, grain and fruit- a definite omnivore |
| Ruby-throated Hummingbird<br>(winters in central and south America and is considered a neotropical migrant) | **Habitat**: woodland, forest edge, orchards, backyards; only hummingbird found east of the Mississippi<br>**Nests:** size of walnut, made of lichens and spider webs<br>Found in trees 8-20 feet off the ground<br>**Eggs:** white, 2 in a clutch<br>**Food:** nectar, insects |
| Indigo Bunting<br>(winters in South America and southern tip of Florida and is considered a neotropical migrant) | **Habitat**: woodland clearings and borders, brushy pastures<br>**Nests:** crotch of samplings, samll bushes, and thicket, 5-15 feet up; made of dried grasses, dead leaves, snake skin, strips of bark, moss, facial tissue, lined with soft materials such as feathers and horse hair<br>**Eggs:** 3-4 blue white, usually unmarked<br>**Food:** grasshoppers, beetles, and seeds of goldenrod, aster thisle, small grains and some berries. |

| | |
|---|---|
| **Junco<br>(year round in northern parts of Pennsylvania; winter only in other locales--migrates north) | **Habitat**: in winter, backyards, old fields, open woods (breeding habitat--coniferous forest in north or high elevation in south)<br>**Nests**: on ground under brush pile or stump-- made of grasses, moss, and rootlets, lined with fine grass and hair<br>**Eggs**: bluish-white speckled with brown; 3-6 in a clutch<br>**Food**: in winter--eats seeds of grasses, weeds and trees; at feeders likes white millet, sunflower seeds, cracked corn (usually feeds on ground); in summer--insects and berries |
| Purple Martin<br>(winters in South America and is considered a neotropical migrant) | **Habitat**: open country near water; towns, farmland, cemeteries<br>**Nests**: mud and green leaves, grasses in tree cavities, "apartment birdhouses"--nests in colonies<br>**Eggs**: white; 3-8 in a clutch<br>**Food**: flies, mosquitoes, wasps, dragonflies, beetles, ants, bugs, butterflies, moths, bees |
| Northern Mockingbird<br>(listed as year-round resident in Peterson's guide, but *Birds of Pennsylvania* lists mockingbird as normally not a winter resident in Pennsylvania) | **Habitat**: forest edges, farmland, golf courses, cemeteries, parks, towns and backyards<br>**Nests**: in dense bush less than 10' above ground; made of coarse twigs, weed stems, string rags--nests are bulky<br>**Eggs**: pale bluish, heavily marked with brown; 2-6 in a clutch<br>**Food**: grasshoppers, beetles are favorite; other insects; half of diet is fruit--holly, pokeberry, grape, mulberry, cherry, poison ivy and others |
| Baltimore Oriole<br>(winters in Mexico and South America; is considered a neotropical migrant) | **Habitat**: open woods, river bottoms, farms, and towns with large trees<br>**Nests**: weaves hanging basket nest on outer branches of elms, poplars, and sycamore trees<br>**Eggs**: bluish-white, marked with dark scrawls; 3-6 in a clutch<br>**Food**: caterpillars, beetles, ants, true bugs, grasshoppers, cherries, blackberries, grapes and nectar--will come to hummingbird feeders and feeders with orange halves |
| Ovenbird<br>(winters in central and south America; is considered a neotropical migrant) | **Habitat**: mature forests, without heavy undergrowth<br>**Nests**: on ground, in slight depression; arched, oven-like nest made of dead grasses, leaves, rootlets, stems, mosses and hair, with opening on the side; often near trail or woods road<br>**Eggs**: white with brown or gray speckles, 3-6 in a clutch<br>**Food**: feeds on ground on snails, slugs, earthworms, weevils, beetles, moths, caterpillars, aphids, crickets, ants and spiders, some seeds and berries |
| Eastern Wood Pewee<br>(winters in central and south America; is considered a neotropical migrant) | **Habitat**: forests, orchards, and in tall shade trees of parks, neighborhoods; usually found in treetops<br>**Nests**: on horizontal limb of oak, maple, elm, apple tree, etc. --15'-50' above ground; thick-walled cup around 3" in diameter; built of weed stems, plant fibers, spider cocoon, string, lined with wool, horsehair bits of thread grasses, usually covered with lichens<br>**Eggs**: cream/white specked or splotched with browns, 2-4 in a clutch<br>**Food**: mostly flies, beetles, bees, wasps, ants, also tussock and gypsy moths, cankerworms, treehoppers, bugs, grasshoppers, some berries especially elderberries, blackberries, pokeberries |

| | |
|---|---|
| Eastern Phoebe<br>(winters in southern United States) | **Habitat**: forest, backyard-usually near water<br>**Nests**: cup-shaped of mud and moss/grass on rocky ledge or building<br>**Eggs:** whitish; 3-8 in a clutch<br>**Food:** bugs, beetles, wasps, ants flies, spiders |
| American Robin<br>(winters in southern United States) | **Habitat**: forest edges, towns, farmland, backyards, parks<br>**Nests**: mud-cup lined with fine grasses in crotch of tree from 3 to 40 feet high<br>**Eggs:** pale blue with no markings; 3-7 in a clutch<br>**Food**: earthworms, grasshoppers, caterpillars, butterflies, other insects; some fruits such as grapes, mulberry, dogwood |
| Chipping Sparrow<br>(winters in southern U.S. and south; this bird is considered a partial neotopical migrant). | **Habitat**: backyard with manicured lawns, evergreen trees, shrubs, grassy fields, forest edges<br>**Nests:** lower branches of evergreen made of grasses, fine twigs, rootlets and lined with fine hair<br>**Eggs:** pale bluish with dark markings; 3-5 in a clutch<br>**Food**: beetles, grasshoppers, spiders, leafhoppers; seeds of grasses ragweed, dandelion; at feeders will eat cracked corn and white millet |
| Grasshopper Sparrow<br>(winters in southern U.S. south to El Salvador, this bird is considered a partial neotropical migrant) | **Habitat:** grasslands, meadows<br>**Nests:** on ground at base of clump of grasses, clover, alfalfa, etc. made of grasses lined with grasses, rootlets, horsehair, usually made in small depression, top usually domed with grass in the back; in loose colonies<br>**Eggs**: cream,-white, speckled/spotted with brown, 3-6 in a clutch<br>**Food**: eats grasshoppers and most other insects, also spiders, snails, earthworms and seeds of grasses, sedges and weeds. |
| Barn Swallow<br>(winters in Panama south to South America and is considered a neotropical migrant) | **Habitat:** farmlands, fields, parks, can even be found in urban areas and suburbs.<br>**Nests:** singly or in small colonies on or inside farm buildings, old houses, under bridges and inside culverts; cup of mud or clay pellets mixed with straws, dried grasses, lined with poultry feathers, horsehair plastered to side of building.<br>**Eggs**: 4-5 white spotted with specks of brown<br>**Food**: catches flying insects in the air (on the wing), drinks and bathes by skimming water. |
| Tree Swallow<br>(winters in southern United States and south) | **Habitat**: wet meadows, marshes and fields by ponds and lakes<br>**Nests**: grassy nest lined with feathers in cavity<br>**Eggs:** white; 4-6 in a clutch<br>**Food:** flying insects, some seeds and berries when cold |
| Chimney Swift<br>(winters in South America) | **Habitat**: cities, towns, woodlands, open country, and lakes.<br>**Nests:** half saucer of twigs glued together with saliva found on the walls of chimneys, other buildings<br>**Eggs**: white; 3-6 in a clutch<br>**Food:** flying insects; feeds on the wing |

| | |
|---|---|
| Rufous-sided Towhee (now known as Eastern Towhee)<br>(winters in southern United States; some may winter in) | **Habitat**: dense underbrush and thickets in open woods; forest edges, old fields<br>**Nests**: usually on ground at bases of bush or under grass; made of dead leaves and bark, lined with grasses<br>**Eggs**: whitish, speckled with red-brown; 2-6 in a clutch<br>**Food**: caterpillars, beetles, true bugs, ants, spiders, sow bugs, moths, salamanders, small snakes, weed seeds, and fruits such as, strawberries, mulberries, holly berries: at feeder--sunflower seeds and white millet |
| House Wren<br>(winters in southern United States) | **Habitat:** overgrown field, forest edge, shrub-dense backyard<br>**Nests**: cavities filled with twigs<br>**Eggs:** white speckled with brown, 5-9 in a clutch<br>**Food**: grasshoppers, crickets, beetles, ants caterpillars, flies, spiders |
| Scarlet Tanager<br>(winters in central and south America)<br>Males- Bright red with black wings and tail during breeding season<br>Female: Olive and yellow overall | **Habitat**: forests and areas with shade trees, esp. oaks<br>**Nests**: on tree limb 10-70ft. high; nests made of fine twigs and weeds, lined with vine tendrils and stems<br>**Eggs:** pale bluish, speckled with brown; 3-5 in a clutch<br>**Food**: mainly insects such as ants, beetles, moths and caterpillars; but also, blackberry, dogwood berries and other wild fruits |
| Wood Thrush<br>(winters in central and south America) | **Habitat:** deciduous forests; often near streams; has adapted to city and country gardens and parks.<br>**Nests:** in crotch or on branch of shrub or tree, usually 6-12 ft. from ground but can be as high as 50 ft.; made of mud and twigs with dead leaves, mosses and lined with rootlets; often white paper or cloth incorporated.<br>**Eggs:** blue or blue-green, 2-5 in a clutch<br>**Food:** insects on or near ground; beetles, ants, caterpillars, moths, grasshoppers, flies, bugs; spiders, sow bugs earthworms, some berries. |
| Rufous-sided Towhee (now known as Eastern Towhee)<br>(winter in southern U.S.; some may winter in | **Habitat**: dense underbrush and thickets in open woods; forest edges, old fields<br>**Nests**: usually on ground at bases of bush or under grass- made of dead leaves and bark, lined with grasses<br>**Eggs**: whitish, speckled with red-brown; 2-6 in a clutch<br>**Food**: caterpillars, beetles, true bugs, ants, spiders, sow bugs, moths, salamanders, small snakes, weed seeds, and fruits such as, strawberries, mulberries, holly berries: at feeder- sunflower seeds and white millet |
| House Wren<br>(winters in southern United States) | **Habitat:** overgrown field, forest edge, shrub-dense backyard<br>**Nests**: cavities filled with twigs<br>**Eggs:** white speckled with brown, 5-9 in a clutch<br>**Food**: grasshoppers, crickets, beetles, ants caterpillars, flies, spiders |

| YEAR ROUND RESIDENTS | |
|---|---|
| Cardinal | **Habitat**: forest edges, old fields, roadsides, backyards, towns, and parks<br>**Nests**: usually less than 10' above ground in thickets--nests made of twigs, rootlets, strips of bark, and lined with grasses and rootlets<br>**Eggs**: whitish; with brown/gray marks; 2-5 in a clutch<br>**Food**: insects, fruits, berries--such as, blackberries, mulberries and grapes and a variety of seeds--at feeders--sunflower seeds, safflower seeds and white millet |
| Black-capped Chickadee | **Habitat**: woods, edges, backyards, parks<br>**Nests**: cavity nester--excavates own but most often uses old woodpecker hole or nest box; nests are made of moss, hair feathers, and grass lined with plant down<br>**Eggs**: white with reddish brown spots; 5-10 in a clutch<br>**Food**: caterpillars, insect eggs, cases and larva, spiders, conifer seeds, berries; at feeders--sunflower seeds, peanut butter, suet |
| Brown-headed Cowbird<br>(not a Pennsylvania native species; native to midwest prairies; moved easterly w/changes in landscape) | **Habitat**: farms, towns, edges or clearings of forest<br>**Nests**: do not build their own nests, female lays eggs in nest of other birds<br>**Eggs**: bluish-white speckled with brown<br>**Food**: corn, wheat, oats, buckwheat, seeds of ragweed, dandelion and some berries and insects; favorite insect is grasshoppers, also eats beetles, caterpillars, alfalfa weevils, cotton weevils, bugs, flies, wasps, ants, some spiders and snails |
| Tufted Titmouse | **Habitat**: deciduous woods, wooded swamps, backyards, parks, towns, and river bottoms<br>**Nests**: cavity nester in old woodpecker holes or boxes; made of leaves, moss bark, lined with feathers<br>**Eggs**: white with brown flecks; 4-8 in a clutch<br>**Food**: caterpillars, ants, bugs, insects, seeds, berries, cherries, blackberries, acorns; at feeder-- sunflower seeds and peanuts |
| White-breasted Nuthatch | **Habitat**: deciduous forest, parks, towns with large trees<br>**Nests**: cavity nester, natural cavity, old woodpecker hole or nest box; made of grass, plant fibers, twigs, often foul-smelling bark chips, fur, feathers, hair<br>**Eggs**: white with browns, reds, purple and grays; 5-10 in a clutch<br>**Food**: caterpillars (esp. gypsy moth), beetles, bugs, ants, flies at feeder and sunflower seeds |

| | |
|---|---|
| **Blue Jay** | **Habitat**: deciduous woods, forest edges, parks, towns, backyards<br>**Nests**: large made of twigs and sticks, lined with grass and feathers- usually 10'-20' high in evergreen tree<br>**Eggs**: olive, buff, pale green or dull blue, with brown or gray spots; 3-6 in a clutch<br>**Food**: opportunistic omnivore, 75% plant matter, 25% animal--acorns, corn, cherries, grapes, pole berries, beetles, grasshoppers, small fish, frogs, caterpillars, bird eggs and nestlings; at feeders, sunflower seeds, whole corn, suet and peanuts |
| **House Finch**<br>**(originally a western bird--introduced to east in 1940 as pets--birds were eventually released by dealers when authorities cracked down)** | **Habitat**: backyards in country, towns, and cities<br>**Nests**: occasional cavity nesters, also nest in potted plants or ivy covered walls and trees near buildings; made of twigs, grasses and lined with horse hair<br>**Eggs**: bluish-white with speckles: 2-6 in a clutch<br>**Food**: seeds, such as thistle, dandelion, and noxious weeds, and some insects |
| **American Goldfinch** | **Habitat**: old fields, young forests, roadsides, backyards<br>**Nests**: built in fork of small branches of trees or shrubs, usually less than 10' off ground; made of thistle, milkweed sown, fine grasses and moss<br>**Eggs**: very pale blue, no marks; 4-6 in a clutch<br>**Food**: seeds of thistle, dandelion, goldenrod, birches, conifers, some berries and insects; at feeder prefers thistle and sunflower seeds |
| **House Sparrow**<br>**(very aggressive cavity nester--not native to US but introduced in 1851 in Brooklyn NY from England)** | **Habitat**: farmland, towns, cities, parks, backyards<br>**Nests**: cavity nester- nest made of any available material--string, straw, twigs, paper, etc.<br>**Eggs**: white, pale blue or pale green with a few gray or brown spots; 3-7 in a clutch<br>**Food**: beetles, grasshoppers, crickets, caterpillars, other insects, grass and weed seeds, corn, wheat, oat-- thrives on grocery store bird mixed with fillers |
| **Starling**<br>**(very aggressive cavity nester; not native; introduced in NY in 1890)** | **Habitat**: farmland, town, cities, backyards<br>**Nests**: cavity nester--large, poorly formed of grasses and twigs<br>**Eggs**: white, pale blue or greenish white; 2-8 in a clutch<br>**Food**: cutworms, Japanese beetles, grasshoppers, clover weevils, beetles and other insect; at feeder-peanut hearts, corn and other grains |

| | |
|---|---|
| *Song Sparrow<br>(some books list this bird as year round resident of PA, others list it as migratory. Listed as year round in the Peterson guide) | **Habitat**: old fields, forest edges, roadsides, thickets<br>**Nests**: on ground or in low shrubs--nests made of grasses and rootlets, lined with fine grasses and hair<br>**Eggs:** pale green to greenish white, heavily speckled, spotted with reddish browns<br>**Food**: grasshoppers, beetles. flies, grass seeds, blackberries, cherries, and grapes; at feeders-sunflower, white millet and cracked corn |
| **Purple Finch<br>(year round resident in some sections of PA; winter only in other locales) | **Habitat**: woods, parks, backyards in suburbs and country<br>**Nests**: in pine and spruce trees, 6-50 ft high- nests made of twigs, grasses and rootlets lined with hair<br>**Eggs:** pale green-blue, speckled with blacks, browns<br>**Food**: tree seeds and wild fruits, some insects |

| **OTHERS** | |
|---|---|
| **Downy Woodpecker**<br>**(year-round resident)** | **Habitat:** open woods of deciduous and coniferous trees, backyards, parks<br>**Nests**: cavity-nester; most often excavates own hole for nest<br>**Eggs:** white; 3-6 in a clutch<br>**Food**: insect eggs and larvae in tree branches and trunks, caterpillars, carpenter ants; variety of fruits and berries; at feeders likes suet, sunflower seeds and peanut butter |
| **Northern Flicker**<br>**(usually migrate south for the winter)** | **Habitat:** open woods, farmlands with some trees, towns, backyards<br>**Nests**: cavity-nester; excavates own cavity; lines with chips<br>**Eggs:** 5-10 white<br>**Food**: ants, crickets, beetles, wasps, will forage on ground for ants; fruits of dogwood, plums, Virginia creeper; at feeders like suet and peanut butter mixes. Will feed on ground. |
| **American Kestrel**<br>**(year-round resident)** | **Habitat:** open country, hayfields, orchards, farms<br>**Nests**: cavity-nester<br>**Eggs:** cream colored, blothed with brown; 3-7 in a clutch<br>**Food:** grasshoppers, mice, small snakes, birds |
| **Cooper's Hawk**<br>***will visit bird feeders to prey on birds** | **Habitat:** broken woodlands, river groves<br>**Nests**: branches and twigs lined with bark usually 25-65ft high in trees<br>**Eggs:** 4-5 white to green white; can have brown spots<br>**Food**: wild birds, some mammals |
| **Sharp-shinned Hawk**<br>***will visit bird feeders to prey on birds** | **Habitat**: deciduous, mixed, and coniferous forest- in winter will go into towns, and cities<br>**Nests**: sticks and twigs placed high in tree in crotch or close to trunk<br>**Eggs:** 3-6 white marked with browns<br>**Food:** small birds and occasionally mice frogs, and insects |
| **Eastern Screech Owl**<br>**(year round resident)** | **Habitat:** woodlands, orchards, towns, and cities with large trees; mostly in wooded areas<br>**Nests**: cavity-nester; often no nest material, sometimes whatever is available<br>**Eggs:** 2-8; usually 4-5; white oval or round<br>**Food**: any small animal-mice, rats, shrew, chipmunks, songbirds |

| | |
|---|---|
| Canada Geese (populations of resident geese and populations of migratory geese; migrants go south for the winter) | **Habitat**: ponds, rivers or streams in a variety of habitats from urban to rural; wetlands<br>**Nests:** usually built on ground near water; grasses, mosses, may be on foundation of sticks; lined with feathers<br>**Eggs:** 2-12; usually 5 or 6; dull white<br>**Food:** grasses, grains (esp. corn), some insects and crustaceans |
| Barn Owl | **Habitat:** woodlands, farms, barns, towns, cliffs<br>**Nests**: usually no nest material; sometimes nests of debris, underground in burrows or elevated nests in barns and steeples<br>**Eggs:** 3-11; usually 5-7; white or buff-white; unmarked<br>**Food**: mice, rats, and some birds |
| Red-tailed Hawk (migrate south for the winter) | **Habitat**: open country, woodlands, mountains, plains<br>**Nests**: branches and twigs lined with grasses, weeds and dead leaves; in tall trees- 20-80 ft above ground in forest areas or groves<br>**Eggs:** 1-5; usually 2-3; dull white with a few brown spots<br>**Food**: mainly rodents, some reptiles |
| Killdeer (migrates south for winter) | **Habitat:** open areas like lawns, airports, cultivated fields, parking lots, airports<br>**Nests**: on ground- scrape in gravel or grass (most often gravel in driveway or parking g lots—returns to nest early spring<br>**Eggs:** 3-5, usually 4; gray-buff; spotted or blotched with black-brown<br>**Food:** earthworm, snails, beetles, flies, spider |
| Mallard Duck | **Habitat:** around ponds rivers, and streams in a variety of habitats from urban to rural; wetlands<br>**Nests**: built on ground among dead grasses, reeds usually near lakes, ponds; sometimes built with leaves and grasses, lined with down feathers.<br>**Eggs:** 5-14; usually 8-10; light green to white<br>**Food:** seed of grasses, grains, sedges, some insects |
| Mourning Dove (year round resident) | **Habitat:** open country, farmland, old fields<br>**Nests**: twigs, usually in evergreen tree<br>**Eggs:** 1-4; usually 2; pure white<br>**Food:** eats seeds of weeds and grasses, as well as sunflower seeds, millet, thistle, cracked corn, safflower seeds |
| Pigeon (Rock Dove also called feral pigeons). Native to Eurasia where they were bred for racing-went wild in U.S. | **Habitat:** cities, towns, suburbs, may also be in country<br>**Nests:** built on a ledge of building, bridge, house, etc; saucer-shape made of loose sticks<br>**Eggs**: white; one or two in a clutch<br>**Food:** seeds, grasses, bread crumbs, food scraps |

# Common Learn List

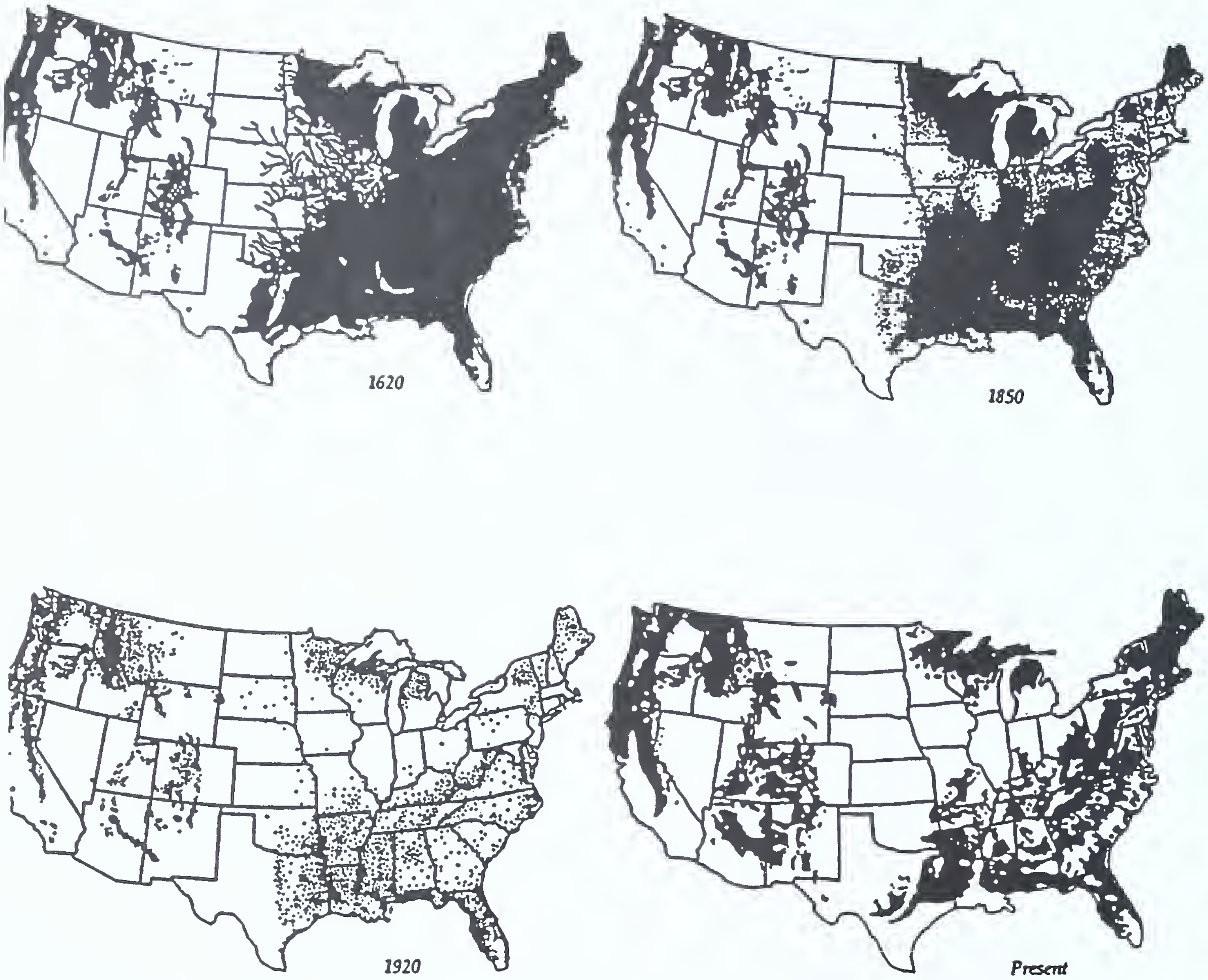
| Species | Peterson's Page | Species | Peterson's Page | Species | Peterson's Page |
|---|---|---|---|---|---|
| 1. Common Loon | 33 | 36. Pileated Woodpecker | 189 | 71. European Starling | 257 |
| 2. Pied-billed Grebe | 35 | 37. Yellow-shafted Flicker | 191 | 72. Baltimore Oriole | 259 |
| 3. Double-crested Cormorant | 41 | 38. Downy woodpecker | 193 | 73. Scarlet Tanager | 261 |
| 4. Whistling Swan | 43 | 39. Great Crested Flycatcher | 195 | 74. House Sparrow | 263 |
| 5. Canada Goose | 47 | 40. Eastern Phoebe | 197 | 75. Dark-eyed Junco | 267 |
| 6. Mallard Duck | 49 | 41. Barn Swallow | 203 | 76. Northern Cardinal | 269 |
| 7. Wood Duck | 51 | 42. Purple Martin | 203 | 77. House Finch | 271 |
| 8. Hooded Merganser | 63 | 43. Tree Swallow | 205 | 78. American Goldfinch | 273 |
| 9. American Coot | 65 | 44. Chimney Swift | 205 | 79. Indigo Bunting | 275 |
| 10. Ring-billed Gull | 87 | 45. American Crow | 207 | 80. Rose-breasted Grosbeak | 277 |
| 11. Common Tern | 97 | 46. Northern Raven | 207 | 81. Rufous-sided Towhee | 277 |
| 12. Great Blue Heron | 101 | 47. Blue Jay | 209 | 82. Chipping Sparrow | 281 |
| 13. Green Heron | 105 | 48. Black-Capped Chickadee | 211 | 83. Field Sparrow | 281 |
| 14. Killdeer | 121 | 49. Tufted Titmouse | 211 | 84. Song Sparrow | 281 |
| 15. American Woodcock | 125 | 50. Brown Creeper | 213 | | |
| 16. Common Snipe | 125 | 51. White-breasted Nuthatch | 213 | | |
| 17. Spotted Sandpiper | 133 | 52. House Wren | 215 | | |
| 18. Ruffed Grouse | 145 | 53. Golden-crowned Kinglet | 217 | | |
| 19. Ring-necked Pheasant | 145 | 54. Gray Catbird | 219 | | |
| 20. Wild Turkey | 145 | 55. Northern Mockingbird | 219 | | |
| 21. Bobwhite | 149 | 56. Brown Thrasher | 219 | | |
| 22. Red-tailed Hawk | 155 | 57. Eastern Bluebird | 221 | | |
| 23. Broad-winged Hawk | 157 | 58. American Robin | 221 | | |
| 24. Bald Eagle | 159 | 59. Wood Thrush | 223 | | |
| 25. Osprey | 159 | 60. Cedar Waxwing | 225 | | |
| 26. Turkey Vulture | 161 | 61. Red-eyed Vireo | 227 | | |
| 27. Sparrow Hawk | 163 | 62. Black and White Warbler | 233 | | |
| 28. Great Horned Owl | 173 | 63. American Redstart | 237 | | |
| 29. Screech Owl | 173 | 64. Yellow Warbler | 239 | | |
| 30. Barred Owl | 175 | 65. Ovenbird | 247 | | |
| 31. Mourning Dove | 181 | 66. Common Yellowthroat | 247 | | |
| 32. Yellow-billed Cuckoo | 183 | 67. Brown-headed Cowbird | 253 | | |
| 33. Common Nighthawk | 185 | 68. Red-winged Blackbird | 253 | | |
| 34. Belted Kingfisher | 187 | 69. Common Grackle | 255 | | |
| 35. Ruby-throated Hummingbird | 187 | 70. Eastern Meadowlark | 257 | | |

# Bird Habitat List

| Species | Habitat | Species | Habitat |
|---|---|---|---|
| 1. Common Loon | *Lakes* | 36. Pileated Woodpecker | *Woods and Wooded Edges* |
| 2. Pied-billed Grebe | *Lakes and Wetlands* | 37. Yellow-shafted Flicker | *Wooded edges, urban* |
| 3. Double-crested Cormorant | *Lakes* | 38. Downy woodpecker | *Woods, wooded edges, urban* |
| 4. Whistling Swan | *Lakes and Wetlands* | 39. Great Crested Flycatcher | *Woods and Wooded edges* |
| 5. Canada Goose | *Lakes and Wetlands* | 40. Eastern Phoebe | *Edges, Streams, Farms Urban* |
| 6. Mallard Duck | *Lakes and Wetlands* | 41. Barn Swallow | *Fields, Wetland, usually by farms* |
| 7. Wood Duck | *Lakes and Wetlands* | 42. Purple Martin | *Open Country usually near water* |
| 8. Hooded Merganser | *Lakes and Wetlands* | 43. Tree Swallow | *Open country often near water* |
| 9. American Coot | *Lakes and Wetlands* | 44. Chimney Swift | *Open area, usually near buildings* |
| 10. Ring-billed Gull | *Lakes, Wetlands and Farm Fields* | 45. American Crow | *All Habitats* |
| 11. Common Tern | *Lakes and Wetlands* | 46. Northern Raven | *Wooded, mountain forests* |
| 12. Great Blue Heron | *Lakes, Wetlands and Streams* | 47. Blue Jay | *Edges, Open Forests, Urban* |
| 13. Green Heron | *Lakes, Wetlands and Streams* | 48. Black-Capped Chickadee | *Woods, Edges, Urban* |
| 14. Killdeer | *Wetlands, Fields and Gravel Lots* | 49. Tufted Titmouse | *Woods, Edges* |
| 15. American Woodcock | *Fields near woods and Wetlands* | 50. Brown Creeper | *Woods, Edges* |
| 16. Common Snipe | *Wetlands* | 51. White-breasted Nuthatch | *Woods, Edges* |
| 17. Spotted Sandpiper | *Lakes, Wetlands and Streams* | 52. House Wren | *Edges, Brushy Fields, Urban* |
| 18. Ruffed Grouse | *Woods and wooded edges* | 53. Golden-crowned Kinglet | *Hemlock Groves, Woods* |
| 19. Ring-necked Pheasant | *Farm Fields and Edges* | 54. Gray Catbird | *Brushy Fields, Edges* |
| 20. Wild Turkey | *Woods and fields near woods* | 55. Northern Mockingbird | *Brushy Fields, Edges* |
| 21. Bobwhite | *Grasslands and Brushy Fields* | 56. Brown Thrasher | *Brushy Fields, Edges* |
| 22. Red-tailed Hawk | *All open area habitats and edges* | 57. Eastern Bluebird | *Fields, Brushy Fields, Edges* |
| 23. Broad-winged Hawk | *Woods and Wooded Edges* | 58. American Robin | *Fields and Urban* |
| 24. Bald Eagle | *Lakes and Wetlands* | 59. Wood Thrush | *Woods and Wooded Edges* |
| 25. Osprey | *Lakes, Wetlands and Streams* | 60. Cedar Waxwing | *Wooded Edges, Wetlands, Brush* |
| 26. Turkey Vulture | *All Habitats* | 61. Red-eyed Vireo | *Woods and Wooded Edges* |
| 27. Sparrow Hawk | *Fields and Edges* | 62. Black and White Warbler | *Woods and Wooded Edges* |
| 28. Great Horned Owl | *All Habitats near Woods* | 63. American Redstart | *Woods and Wooded Edges* |
| 29. Screech Owl | *All habitats with some trees* | 64. Yellow Warbler | *Brushy Fields, Edges* |
| 30. Barred Owl | *Woods, Wooded Wetlands, Edges* | 65. Ovenbird | *Woods and Wooded Edges* |
| 31. Mourning Dove | *Fields, Farms, Edges and Urban* | 66. Common Yellowthroat | *Wetlands, Brushy Fields, Edges* |
| 32. Yellow-billed Cuckoo | *Brushy fields, Edges* | 67. Brown-headed Cowbird | *Urban, Farms, Edges* |
| 33. Common Nighthawk | *Open Country, Urban* | 68. Red-winged Blackbird | *Wetlands, Fields near water* |
| 34. Belted Kingfisher | *Wetlands and Streams* | 69. Common Grackle | *Urban and Edges* |
| 35. Ruby-throated Hummingbird | *Edges, Brushy fields, Urban* | 70. Eastern Meadowlark | *Fields and Farms* |

| Species | Habitat |
|---|---|
| 71. European Starling | *Urban and Farms* |
| 72. Baltimore Oriole | *Wooded Edges and Urban* |
| 73. Scarlet Tanager | *Woods and Wooded Edges* |
| 74. House Sparrow | *Urban and Farms* |
| 75. Dark-eyed Junco | *Field, Brushy Field, Edge, Urban* |
| 76. Northern Cardinal | *Brushy Fields, Edges, Urban* |
| 77. House Finch | *Edges, Urban* |
| 78. American Goldfinch | *Brushy Fields, Edges* |
| 79. Indigo Bunting | *Brushy Fields, Wooded Edges* |
| 80. Rose-breasted Grosbeak | *Woods and Wooded Edges* |
| 81. Rufous-sided Towhee | *Brushy Woods and Fields, Edges* |
| 82. Chipping Sparrow | *Woods and Wooded Edges* |
| 83. Field Sparrow | *Fields, Brushy Fields* |
| 84. Song Sparrow | *Fields, Brushy Fields, Edges* |

## UNITED STATES FOREST COVER FROM 1620 TO PRESENT


1620

1850

1920

Present

Because each dot represents 25,000 acres, smaller areas of forest cover are not represented.

Source: Gilchrist, Susan, Row, Kadi and Borneman, David. *One Bird, Two Habitats.* Wisconsin Department of Natural Resources, 1993.

## THE BIRDS HAVE A PARTY

There was a knock at the door of the old hollow tree. Since it was Halloween, the common yellowthroat thought the visitors might be: *"witchity, witchity, witch."* The hairy woodpecker said to open the door just a crack so it could: *"peek, peek."*

The black-throated blue warbler asked someone else to see who was there, saying: *"I'm so lay-zee, I'm so lay-zee."* The great gray owl went toward the door, asking the visitors: *"whoo, whoo, whoo?"*

Outside, the tufted titmouse quickly announced its name: *"peter, peter, peter."* The great blue heron also croaked out its name: *"frank, frank, frank."* Just to be different the ovenbird wouldn't give its name, but instead announced its profession: *"teacher, teacher, teacher."* And the black-and-white warbler, who had asthma, sounded very: *"wee-zee, wee-zee, wee-zee."*

The visitors all came in, and the chestnut-sided warbler greeted them with: *"please, please, pleased to meet-cha."* The mute swan said . . . nothing.

Soon feeling very hungry, the barred owl asked the group: *"who cooks for you, who cooks for you-all?"* Not being much of a chef, the Acadian flycatcher suggested: *"pizza, pizza, pizza."* The oldsquaw really wanted some: *"owl-omelet, owl-omelet"*, but since they all were birds, they decided not to eat eggs.

The pizza finally arrived. The wild turkey made short work of its portion: *"gobble, gobble, gobble."* Fearing that everyone was eating too fast, the Tennessee warbler reminded them to slow down a bit and: *"chew, chew, chew."*

Wanting a drink, the olive-sided flycatcher requested: *"quick THREE beers."* Not wishing to serve anything alcoholic, the Carolina wren suggested that they put on the: *"tea kettle, tea kettle, tea kettle."* When it was ready, the rufous-sided towhee called everyone to come and: *"drink your tea-eee, drink your tea-eee."* The prothonotary warbler asked for more sugar, liking its tea very: *"sweet, sweet, sweet."*

Someone spilled a cup of tea on the floor, and the Bachman's sparrow warned everyone to be careful and not: *"slip, slip, slip."* The mallard agreed with the need for caution, saying that the only doctor in town was a: *"quack, quack, quack."*

Suddenly, the gray catbird called out from a hiding place and scared everyone with a: *"meow, meow."* The red-headed woodpecker saw no humor in this, and told it to stop acting so: *"queer, queer, queer."* But the laughing gull thought this prank was very funny: *"ha-ha-ha-haah-haah."*

The party was a great success. Later as everyone began to leave the hollow tree and fly to their own nests, the northern cardinal remained behind on a branch, declaring: *"what cheer, what cheer!"*

Barbara Brozyna
*Jersey Shore Audubon Society*

## BIRD SONGS PUPPET SHOW

**Characters:**
Rocky Raccoon
Mr. Bird - brightly colored
Ms. Bird - same shape, duller coloration

**Prop:** Sign reading, "Next day, 5 AM"

**Mr. Bird:**
Twee Tweedle Dee, Titter Tatter Teer
Twee Tweedle Dee, Titter Tatter Teer

**Rocky Raccoon:** (Waking up) Mr. Bird, Mr. Bird, Mr. Bird! You have been singing that same song with those same words over and over and over again since five o'clock this morning. No offense, but it's *driving me crazy.* If you insist upon singing for so long, can't you at least change the song?

**Mr. Bird:** Change the song? I can't just change my song! It'd be like asking you to start barking like a dog.

**Rocky:** What do you mean? I hear lots of different bird songs.

**Mr. Bird:** Yes, but they're coming from lots of different birds. Each different kind of bird has a different special song of its own and mine is "Twee Tweedle Dee, Titter Tatter Teer; Twee Tweedle Dee . . ."

**Rocky:** Yes, yes, I know what your song is. Ok, I accept the fact that you only sing one song. But *why* do you have to keep singing it?

**Mr. Bird:** Because I'm looking for a mate, a partner, a Mrs. Bird . . .

**Rocky:** Oh, brother. I should have known, the same old story.

**Mr. Bird:**
That's what my song means:
Twee Tweedle Dee
Come see me
Titter Tatter Teer
I'd like you here
(flies off singing)

**Rocky:** Twee Tweedle Dee, come see me. I think this bird is going to drive me *crazy.* I think it's driven me crazy. I'm starting to talk to myself. Well, I think the only way I'll get that bird to stop singing is to find

him a mate. Here goes: Twee Tweedle Dee. Come see me. Titter Tatter Teer. I'd like you here. Come on audience, I could use some help. Twee Tweedle Dee. Come see me. (Ms. Bird appears)

**Ms. Bird:** Why I could have sworn I heard a Twee Tweedle Dee, Titter Tatter Teer coming from here. But I don't see any bird like me around. (starts to leave)

**Rocky:** Don't leave yet, Ms. Bird. If you go right by that tree over there, I'm sure you'll find yourself a handsome mate.

**Ms. Bird:** Thanks for the advice, Rocky. (leaves)

**Rocky:** Oh, I think this is going to work. Maybe I'll be able to sleep late now. (Mr. and Ms. Bird seen flying around together) It looks good. It looks very good! Thank you so much for the help, audience. No more five o'clock mornings for me. (flies down, snores a little; sign saying "Next Day-5 AM" appears)

**Mr. Bird:** Twee Tweedle Dee, Titter Tatter Teer
Twee Tweedle Dee, Titter Tatter Teer

**Rocky:** (Waking up) I don't believe it. He's still singing at five o'clock in the morning. Mr. Bird. What is going on? I found you a mate.

**Mr. Bird:** Yes, but my song is not only to find me a mate.

**Rocky:** But you told me it meant Twee Tweedle Dee, come see me. Titter Tatter Teer, I'd like you here. Isn't that right, audience? (pause)

**Mr. Bird:** Yes, but it also means
Twee Tweedle Dee
Stay away from me
Titter Tatter Teer
Don't come near

**Rocky:** One song means two different things?

**Mr. Bird:** You said it. To a Ms. Bird it means one thing and to a Mr. Bird it means something else.

**Rocky:** But why are you trying to keep birds away?

**Mr. Bird:** Because this is *my* territory, *my* home. Mrs. Bird and I are going to build a nest and raise young here. My song will keep other birds like me away.

**Rocky:** Have you ever considered No Trespassing signs?

**Mr. Bird:** I'd rather sing.

**Rocky:** So when spring is over and Mrs. Bird and you have built your nest, raised your young, and we're well into summer, *then* will you be quiet?

**Mr. Bird:** Well, not completely quiet. I won't be singing my Twee Tweedle Dee so much, but I'll still be making my short calls to warn others of danger and tell them where there's food.

**Rocky:** As long as there won't be *quite* so much Twee Tweedle Deeing.

**Mr. Bird:** Speaking of which, I better get singing. Twee Tweedle Dee, Titter Tatter Teer. Bye, bye everyone. Twee Tweedle Dee . . .

Reprinted with permission from: *Hands on Nature.*

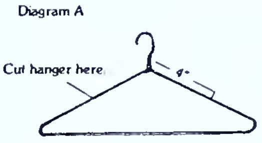
# TAKE A BIRD TO LUNCH

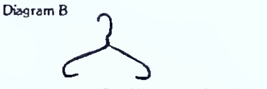
*Setting up a feeding station is a great way to watch birds. Here are a few ideas for how to make some simple feeders using inexpensive materials you can find around the house. On the back, we've also included a few activity ideas you might want to try.*

*Once you set up a feeding station, it'll take the birds a little while to know it's there. But as soon as they find it, they'll keep coming back as long as you keep it stocked with food.*

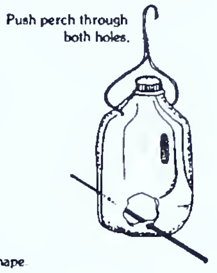
## A PLASTIC JUG FEEDER

***Materials:***
- ***plastic milk or juice bottle with screw-on lid (make sure it's clean and dry)***
- ***nail or other sharp object for punching holes in the bottle***
- ***sharp scissors***
- ***wooden dowel, ³⁄₁₆" (5 mm) wide and about 9" (23 cm) long***
- ***jar lid, 2" (5 cm) in diameter***
- ***wire clothes hanger***
- ***wire cutters***





Bend hanger to this shape.

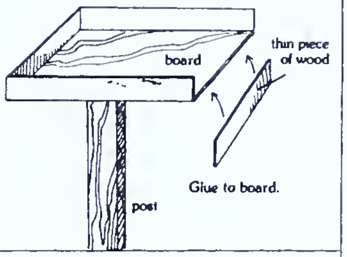

Push perch through both holes.

1. Trace the outline of the jar lid onto opposite sides of the plastic jug, at least 1½" (4 cm) from the bottom. Use sharp scissors to cut out the circles.
2. To make a perch, use the nail to poke a hole ½-1" (1.3-2.5 cm) under each circle. Insert the dowel so that it passes through one hole, through the jug, and out the hole on the other side.
3. Poke several small holes in the bottom of the jug so rainwater will drain out.
4. Cut a clothes hanger in two places with the wire cutters (see diagram A). Each cut should be at least 4" (10 cm) from the base of the hook. Bend the hanger so it looks like diagram B.
5. Use the nail to poke a hole about 1" (2.5 cm) from the bottle's top. Do the same on the other side of the bottle, opposite the first hole.
6. Push the ends of the hanger into the holes. Adjust the hanger so that the feeder hangs evenly and the ends of the hanger don't slip out of the holes.
7. Screw the lid on the bottle. Then fill your feeder and hang it up.

## A PLATFORM FEEDER

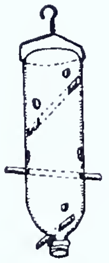
***Materials:***
- ***flat board, at least 12" (30 cm) square***
- ***4 thin pieces of wood, each about 2" (5 cm) wide and as long as one side of the flat board***
- ***tall post and post-hole digger (optional)***
- ***nails or waterproof glue***

1. Drill several holes in the board for drainage.
2. Cut the thin pieces of wood into lengths to match each side of the board. Nail or glue them in place (see diagram).
3. Nail the feeder to the top of an old stump or sink a post into the ground and nail the platform on top of it. Place the seeds, grains, or other food directly onto the board.



## SODA BOTTLE THISTLE FEEDER

***Materials:***
- ***large plastic soft drink bottle (liter size)***
- ***3 or 4 wooden dowels, each ³⁄₁₆" (5 mm) wide and about 8" (20 cm) long***
- ***X-acto knife***
- ***nail or other sharp object for punching holes in the bottle***
- ***wire clothes hanger***
- ***wire cutters***



1. Wash the bottle and remove the label and colored base.
2. To make a perch, use a nail to punch 2 holes in the bottle, opposite each other. Insert a dowel so that it passes through one hole, through the bottle, and out the hole on the other side. Make 3 or 4 such perches, alternating the positions so that all sides of the bottle are used.
3. Now you're ready to cut the feeding holes. (Remember that the finished feeder will hang with the bottle's neck facing *down*.) With the neck facing toward you, use an X-acto knife to cut a ¼" long by ⅛" wide (6 × 3 mm) hole about 2" (5 cm) above each perch. Keep in mind that the seeds will fall out if the holes are too big.
4. Cut a clothes hanger in two places with the wire cutters (see diagram A, above). Each cut should be at least 4" (10 cm) from the base of the hook. Bend the hanger so it looks like diagram B (above).
5. Use the nail to poke a hole in the bottle, about 2½" (6.3 cm) from the bottle's *base* (not its neck). Do the same on the other side of the bottle, opposite the first hole.
6. Push the ends of the clothes hanger into the holes. Adjust the hanger so that the feeder hangs evenly and the ends of the hanger don't slip out of the holes.
7. Fill the feeder with niger ("thistle") seeds, replace the cap, invert it, and hang it from a tree.

(Reprinted with permission of U.S. Fish and Wildlife Service.)

## A QUICK LOOK AT OTHER FEEDERS

Here are a few other ideas for some easy feeders you can make

- Tie a piece of string around a pine cone. Fill the spaces in the pine cone with suet, peanut butter, or a mixture of suet, peanut butter, and birdseed. Hang your pine cone feeder by tying the string to a branch.
- Fill foil dishes, empty margarine tubs, or the skins of orange or grapefruit halves with seeds or suet. Use wire or string to hang the feeders from a tree.
- String unshelled peanuts, popcorn, and/or berries together and drape them over tree branches.
- If hummingbirds live in your area you can attract them to your schoolyard or nature center with a nectar feeder. For instructions on how to make a simple nectar feeder, see "Invite a Hummer to Lunch," *Ranger Rick*, June 1985, pages 13-14.
- Nail metal bottle caps to a log and fill the caps with peanut butter or suet. Hang the log from a tree with wire or string.

Source: *National Audubon Society*

## WHAT'S ON THE MENU

Here's a rundown of some of the foods you can "serve" at your feeding station.

- **Seeds**—Seeds are food for many birds and are usually available in prepackaged mixes in grocery stores, garden supply shops, hardware stores, agricultural supply stores, and some nature centers You can fill your feeders with these mixes or buy the different types of seeds individually and create your own mixes (Keep in mind that some prepackaged mixes contain certain kinds of seeds that are "unpopular" with many birds ) Here are a few examples of some different types of seeds and the birds they attract

  ***Millet*** is eaten by doves, finches, sparrows, and many other birds. There are many different types of millet Common, or proso, millet has wide appeal—especially the white variety

  ***Sunflower seeds*** are a favorite of grosbeaks, cardinals, chickadees, and many other birds.

  ***Safflower seeds*** are not quite as "popular" as sunflower seeds, but cardinals and some other birds will eat them

  ***Niger ("thistle") seeds*** attract goldfinches, redpolls, pine siskins, and some other types of finches. (These seeds are best served in a hanging feeder. They don't "work well" on platform feeders because they're very light and can blow away easily )
- **Grains**—You can spread corn, oats, wheat, and other grains on the ground, put them on a platform feeder, or mix them with other seeds and put them in a hanging feeder (Grains usually make up a large portion of any commercial birdseed mix, and some are available separately in agricultural supply stores and other stores that sell birdseed )

  *Note:* Make sure you do not use grains that have been treated for planting Some are coated with chemicals that are harmful to birds.
- **Suet**—Woodpeckers, chickadees, nuthatches, and titmice are all suet eaters. Many grocery stores and butcher shops will sell suet for next to nothing (and some even give it away). To serve suet, put it in a mesh onion bag and hang the bag from a tree. You can also spread suet on tree branches, put it in a suet log (see the last suggestion under "A Quick Look at Other Feeders"), or buy a special wire suet basket. You can also grind suet up or melt it down, mix it with seeds or grains, then put the mixture in a foil pan.
- **Nuts**—You can include almost any unsalted, shelled nuts at your feeding station. Just break the nuts into small pieces and put them on the ground or a platform feeder You can also use peanut butter—either by itself or mixed with suet or seeds.
- **Fruits**—Orioles, tanagers, mockingbirds, and others like to eat fruits Try anchoring orange halves to a tree branch or nailing them to a platform feeder. You can also cut apples, bananas, dates, or other fruit into small pieces and spread them out on a platform feeder Raisins are another favorite—especially if they've been softened (You can soften raisins by steaming them or letting them soak in water for a while.) A lot of birds will eat coconut too, but remember: PROVIDE FRESH COCONUT ONLY. Dried, packaged coconut can swell in a bird's stomach and kill it.

## TIPS AND TRICKS FOR FEEDING

- Place only the amount of food in a feeder that can be eaten within a few days.
- Keep feeding areas clean by raking up spilled seeds and grains periodically and wiping off messy feeders.
- Use only fresh, clean, dry seeds and grains in your feeders
- Put the feeders in places that are protected from the wind and that have lots of cover nearby.
- Plant trees and shrubs that provide food for the birds. Contact your state Soil Conservation Service office for information about the best plants for your area. (Look in the phone book under Government, U.S. Department of Agriculture )
- Provide water at your feeding station by setting up a simple saucer birdbath. Use a clay saucer that is at least 24 inches (60 cm) in diameter. Set the saucer on a low tree stump or right on the ground and fill it with 1½ inches (4 cm) of water (Clean and refill the birdbath every few days )

## SEASONAL TREATS

- ***Make a No-Scare Scarecrow for the Birds***

  Have the kids build a scarecrow using corn husks, straw, or newspaper stuffed into old clothing. Attach the scarecrow to a wooden post or fence and set it near a window so the kids can watch. Every day, assign a group of children to "fill up" the scarecrow Have them scatter millet, sunflower seeds, and cracked corn on the ground, as well as on the scarecrow's shoulders, arms, and hat They can also stick raisins, coconut, dry cereal, and peanut butter on the scarecrow or hang pine cones rolled in peanut butter or suet from its head for "bushy" hair.
- ***Trim a Tree for the Birds***

  Decorate an evergreen tree for the birds by stringing popcorn, toasted oat cereal, and stale doughnuts and hanging the lines on trees. Make ornaments using scooped out oranges and grapefruits, gourds, and coconuts filled with peanut butter, suet, or other bird treats
- ***Dress Up a Snow Sculpture for the Birds***

  Have the kids make a snowperson or some type of animal snow sculpture. Then have them scatter seeds, bread crumbs, bits of fruit and other bird treats on the sculpture. For example, on the snowperson, they could hang peanut butter pine cones from its hat, stick raisins and peanuts on its face for its eyes, nose, and mouth, and hang a necklace of stale doughnuts around its neck
- ***Make a Valentine for the Birds***

  Trace a heart on a piece of paper and cut it out. Then place the heart on a piece of stale bread and cut around the edges of the heart Brush on egg white and sprinkle on some birdseed. Then hang the heart from a tree.

## FOOD FOR THOUGHT

Divide the group into four or five teams and have each team think up a feeding experiment, using a homemade feeder and different types of bird food. Explain that each team must first come up with a hypothesis, or proposition, they want to test.

Here are some examples

- Hummingbirds prefer red sugar water over other colors.
- Woodpeckers prefer suet rolled in birdseed over plain suet or suet mixed with oats
- Tray feeders get used more if they are close to bushes, trees, or other natural shelter.
- Doves prefer blue or green cracked corn to yellow or red cracked corn. (Just soak the corn in food coloring for a few minutes, then let it dry before putting it out )
- A feeding station with many different kinds of food will attract a larger variety of birds than a feeding station with just one type of food.
- Most birds feed more in the morning than in the afternoon.
- Seed-eating birds prefer a wild birdseed mix of 65% sunflower seeds, 20% cracked corn, and 15% millet, compared to 100% sunflower seeds.
- More birds will feed from a green feeder than from a red feeder of the same design that contains the same type of seeds.

Tell the teams they will need to design their experiments so they can test their hypotheses. That means they must set up a system that will allow them to record their data accurately. For some experiments, they can weigh the food before they put it out on the feeder and then again at the end of each day For other experiments, they can set up one type of feeder in three different areas or use a feeder that is divided into equal-sized compartments—each filled with a different color or type of food.

Have each team keep a data book to record the data they collect. Remind them to write with pencils or ballpoint pens (some pen ink runs when it gets wet) and label and date all their entries.

When the experiments are completed have each team write up a report explaining their experiment and the results. Then have each team make a presentation to the rest of the groups explaining what they did, how the results supported or disproved their hypothesis, and some of the reasons that the results might not be accurate. Here are some questions you can ask each team

- What were some of the problems you had in designing your experiment and collecting the data?
- What might you have done differently?
- Did the results support your hypothesis? Why?
- How might you have made errors? (By not weighing the food accurately, not keeping an accurate record of the birds that visited the feeder, not taking the weather and other factors into consideration, and so on.)

Source: *National Audubon Society*

# 5 Ways to Help WatchList Birds

NATIONAL AUDUBON SOCIETY

**The WatchList is a centerpiece of bird conservation at the National Audubon Society. With its positive approach to protecting North America's birds, the WatchList fits perfectly with Audubon's mission to conserve birds and their habitats — it harnesses the strength that builds when activism, education, and advocacy are built on science.**

**FOR INFORMATION ABOUT THE WATCHLIST CONTACT:**

*Vincent Muehter*
*Associate Director*
*of Conservation*
*NAS, 700 Broadway*
*NY, NY 10003*

*phone:*
*(212) 979-3150*

*email:*
*vmuehter@audubon.org*

The WatchList calls attention to birds at risk before they require federal listing, stressing preventative action today over last-minute rescue attempts in the future. Compiled by scientists from Partners in Flight (of which Audubon is an active partner), the WatchList targets bird species with declining populations, limited ranges, and facing threats such as habitat loss on their breeding and wintering grounds. While saving species pushed to the edge of extinction is logistically difficult, costly and politically confrontational, the WatchList serves as an early-warning system to wildlife management agencies, non-governmental organizations, private landowners, and the public.

The WatchList is dynamic and evolving. As citizen scientists learn more about the trends and distributions of North America's bird populations through surveys and research; as we learn more about threats to birds; and as conservation programs designed to help WatchList species take effect, the WatchList will be updated yearly to reflect the most current and best knowledge available on species at risk.

**Explore the WatchList on-line**

<http://www.audubon.org/bird/watch/>. Audubon's WatchList website is informative and user-friendly, featuring exciting interactive sections like "WatchList for Kids" and "WatchList Birds in Your Backyard." Plus, each WatchList species holds its own web page explaining why its at risk, and providing a brief account of its natural history, a photograph, breeding/wintering range maps, and an outline of threats.

***Now turn the page to find out how YOU can help WatchList birds!*** ☞

## WATCHLIST

**SEABIRDS**
Black-capped Petrel
Black-vented Shearwater
Ashy Storm-Petrel
Black Storm-Petrel
Red-faced Cormorant
Xantus' Murrelet
Whiskered Auklet

**LONG-LEGGED WADERS**
Reddish Egret

**WATERFOWL**
Trumpeter Swan
Ross's Goose
Emperor Goose
Brant
Mottled Duck
American Black Duck

**BIRDS OF PREY**
Swallow-tailed Kite
Snail Kite
Short-tailed Hawk

**SHOREBIRDS**
Yellow Rail
Black Rail
Snowy Plover
Mountain Plover
Black Oystercatcher
Willet
Bristle-thighed Curlew
Long-billed Curlew
Hudsonian Godwit
Black Turnstone
Surfbird
Red Knot
Rock Sandpiper
Stilt Sandpiper
Buff-breasted Sandpiper
Short-billed Dowitcher
Franklin's Gull
Heermann's Gull
Yellow-footed Gull

**PIGEONS AND DOVES**
White-crowned Pigeon
Band-tailed Pigeon

**OWLS AND NIGHTJARS**
Elf Owl
Short-eared Owl
Chuck-will's-widow

**SWIFTS AND HUMMINGBIRDS**
Black Swift
Buff-bellied Hummingbird
Lucifer Hummingbird
Rufous Hummingbird
Allen's Hummingbird

**WOODPECKERS**
Lewis' Woodpecker
Red-headed Woodpecker
Nuttall's Woodpecker
Strickland's Woodpecker
White-headed Woodpecker
Gilded Flicker

**FLYCATCHERS AND SONGBIRDS**
Greater Pewee
Island Scrub-Jay
Oak Titmouse
Bridled Titmouse
Brown-headed Nuthatch
Bicknell's Thrush
Wood Thrush
Long-billed Thrasher
Bendire's Thrasher
Curve-billed Thrasher
California Thrasher
Le Conte's Thrasher
Sprague's Pipit
Bell's Vireo
Gray Vireo
Golden-winged Warbler
Virginia Warbler
Colima Warbler
Lucy's Warbler
Black-throated Blue Warbler
Hermit Warbler
Prairie Warbler
Cerulean Warbler
Prothonotary Warbler
Worm-eating Warbler
Swainson's Warbler
Kentucky Warbler
Red-faced Warbler
Olive Warbler
Painted Bunting
Dickcissel
Abert's Towhee
Bachman's Sparrow
Botteri's Sparrow
Cassin's Sparrow
Rufous-winged Sparrow
Clay-colored Sparrow
Brewer's Sparrow
Black-chinned Sparrow
Sage Sparrow
Lark Bunting
Baird's Sparrow
Henslow's Sparrow
Saltmarsh Sharp-tailed Sparrow
Nelson's Sharp-tailed Sparrow
Seaside Sparrow
Harris' Sparrow
McCown's Longspur
Smith's Longspur
McKay's Bunting
Bobolink
Audubon's Oriole
Lawrence's Goldfinch

# 5 WAYS TO HELP

## 1

**Help Identify Important Bird Habitats:**

*Participate in Audubon's IBA Program*

The greatest threat to WatchList and other bird species is habitat loss as a result of human-related activities. The Important Bird Area (IBA) Program is a coordinated response - a comprehensive effort to protect habitats critical to birds' survival. IBAs are places birds need to successfully breed, survive, the winter, and/or migrate. They include places like wetlands where birds occur in significant numbers and diversity, and can encompass private or public land such as a National Wildlife Refuge. National Audubon Society established the first state IBA program in 1995 with the goal to develop an inventory of IBAs in each of the United States. In partnership with the American Bird Conservancy, Audubon is helping to conserve these places around the country through our state field offices, and with the enthusiastic participation of chapters and members. IBAs programs are currently underway in the following states: Alaska, California, Idaho, Maine, Missouri, New York, Pennsylvania, South Carolina, and Tennessee. If you live in one of these states, contact the state IBA coordinator directly for information on how you can participate.

---

**STATE IBA PROGRAMS (CURRENT) AND CONTACTS:**

| | | |
|---|---|---|
| Alaska | John Schoen | (907) 276-7034 |
| California | Mini Nagendran | (916) 481-5332 |
| Idaho | Dan Svingen | (208) 983-1963 |
| Maine | Joseph Spaulding | (207) 564-7946 |
| Missouri | Brad Jacobs | (573) 751-4115 |
| New York | Jeffrey Wells | (607) 254-2441 |
| Pennsylvania | Gary Crossley | (717) 763-4985 |
| South Carolina | Caroline Eastman | (803) 777-8103 |
| Tennessee | Janet Troup | (615) 781-6610 |

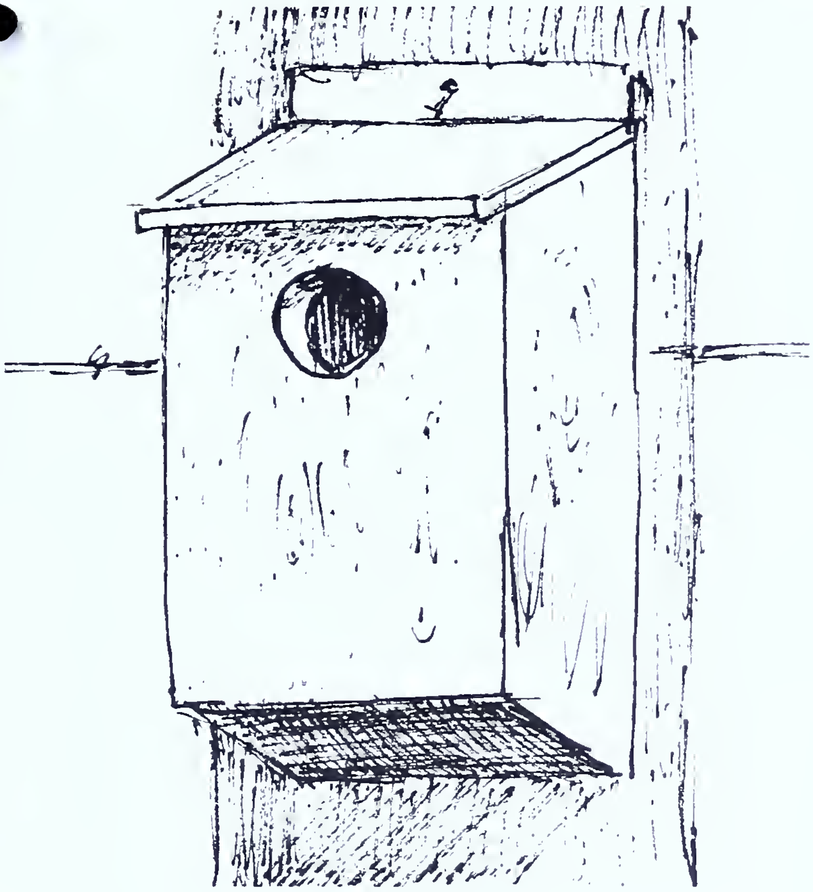
If an IBA program is not yet established in your state, please help identify places now that may qualify for a new state IBA program in the near future. The special "IBA Discovery Form", included here, will get you started.

**FOR MORE IBA INFORMATION, PLEASE CONTACT:**

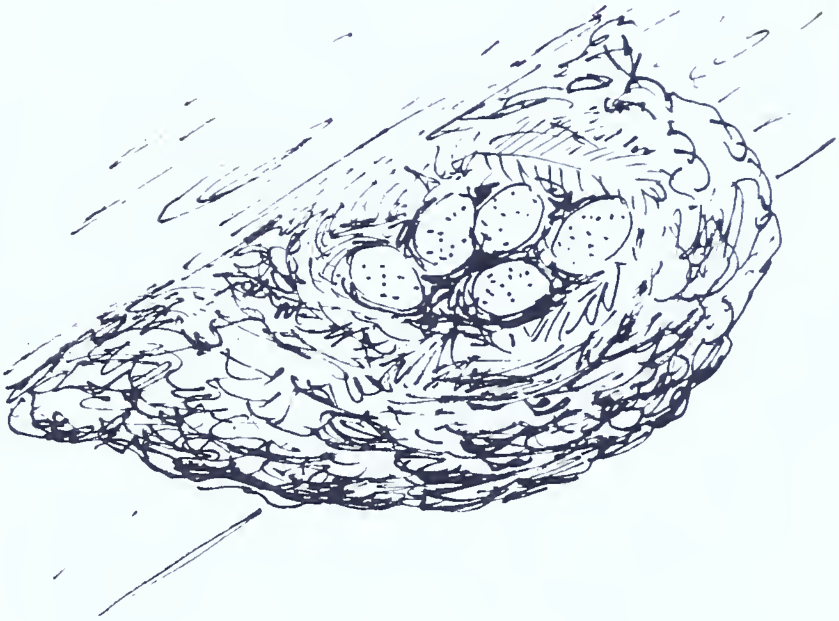
Fred Baumgarten, IBA National Coordinator,
National Audubon Society,
700 Broadway, NY, NY 10003.

Phone (212) 979-3081; email: fbaumgarten@audubon.org

**Eastern Bluebird Nest**



**Barn Swallow Nest**



**American Goldfinch Nest**

**American Robin Nest**

## Eastern Bluebird

**Habitat**: open country, orchards, farms, backyards, parks
**Nests**: nests of grass or pine needles in cavity
**Eggs**: pale blue to white; 2-6 in a clutch
**Food**: insects, earthworms (in fall--fruits of cedar, sumac, grape and pokeweed) (usually migrates in winter but at times will stay and feed at feeders--raisins, mealworms, peanut butter with cornmeal)

## American Goldfinch

**Habitat**: old fields, young forests, roadsides, backyards
**Nests**: built in fork of small branches of trees or shrubs, usually less than 10' off ground; made of thistle, milkweed sown, fine grasses and moss
**Eggs**: very pale blue, no marks; 4-6 in a clutch
**Food**: seeds of thistle, dandelion, goldenrod, birches, conifers, some berries and insects; at feeder prefers thistle and sunflower seeds

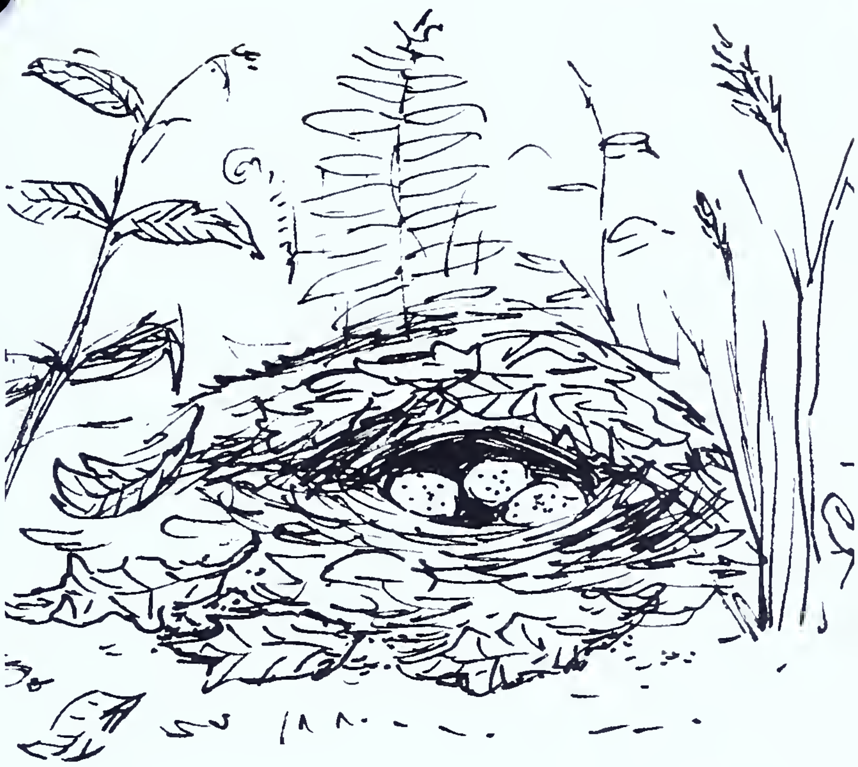
## Barn Swallow

**Habitat:** farmlands, fields, parks, can even be found in urban areas and suburbs
**Nests:** singly nests in small colonies; cup of mud or clay pellets mixed with straws, dried grasses, lined with poultry feathers, horsehairs, plastered to side of horizontal or vertical surface
**Eggs:** 4-5, white spotted with specks of brown
**Food:** catches flying insects in the air (on the wing); drinks and baths by skimming water

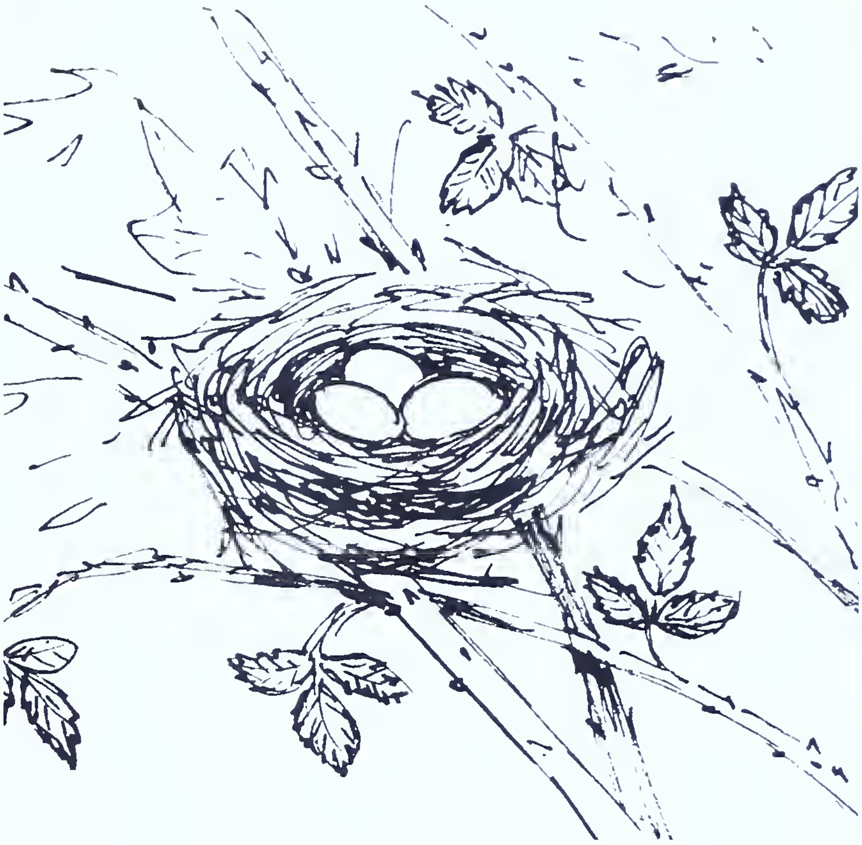
## American Robin

**Habitat**: forest edges, towns, farmland, backyards, parks
**Nests**: mud-lined cup with fine grasses in crotch of tree from 3'-40' high
**Eggs**: pale blue with no markings; 3-7 in a clutch
**Food**: earthworms, grasshoppers, caterpillars, butterflies, other insects; some fruits such as grapes, mulberry, dogwood

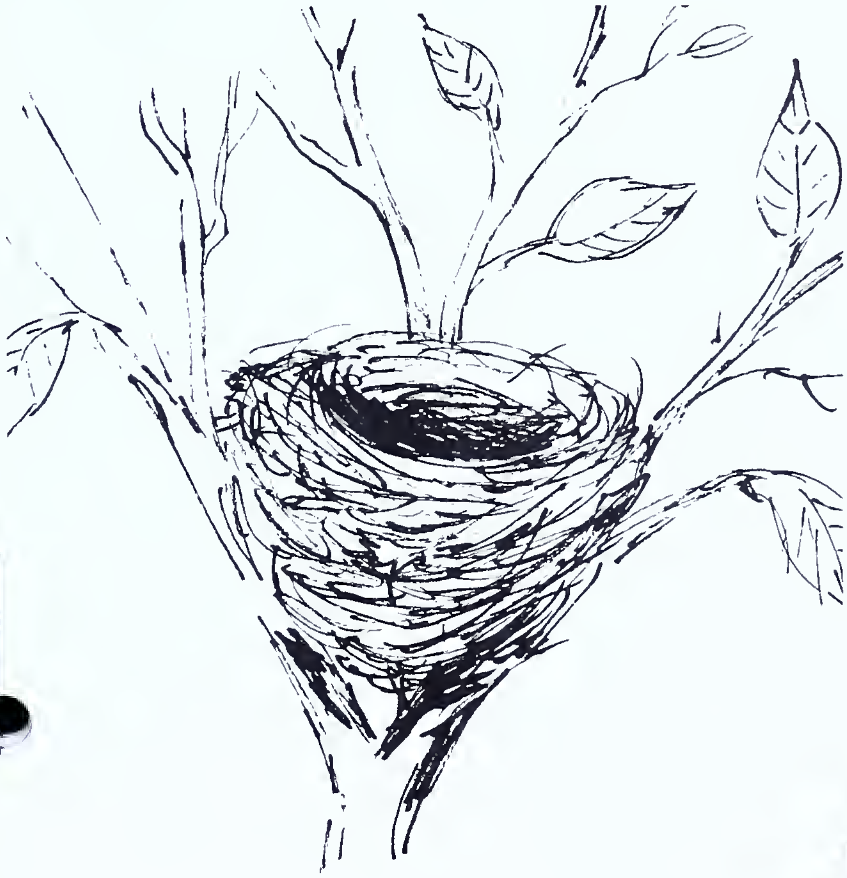
**Ovenbird Nest**



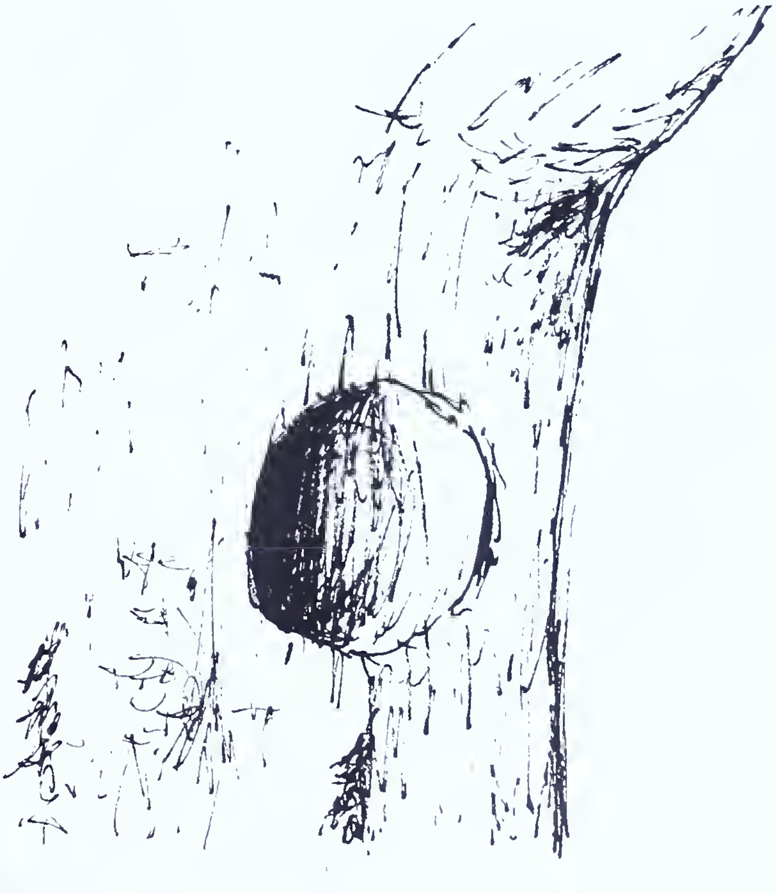
**Gray Catbird Nest**



**Wood Thrush Nest**



**Tufted Titmouse Nest**



## Ovenbird

**Habitat**: mature forests, without heavy undergrowth
**Nests**: on ground, in slight depression; arched, oven-like nest made of dead grasses, leaves, rootlets, stems, mosses and hair, with opening on the side; often near trail or woods road
**Eggs**: white with brown or gray speckles, 3-6 in a clutch
**Food**: feeds on ground on snails, slugs, earthworms, weevils, beetles, moths, caterpillars, aphids, crickets, ants and spiders, some seeds and berries

## Wood Thrush

**Habitat**: deciduous forests; often near streams; has adapted to city and country gardens and parks
**Nests**: in crotch or on branch of shrub or tree, usually 6'-12' from ground but can be as high as 50'; made of mud and twigs with dead leaves, mosses and lined with rootlets; often white paper or cloth incorporated
**Eggs**: blue or blue-green, 2-5 in a clutch
**Food**: insects on or near ground; beetles, ants, caterpillars, moths, grasshoppers, flies, bugs; spiders, sow bugs earthworms, some berries

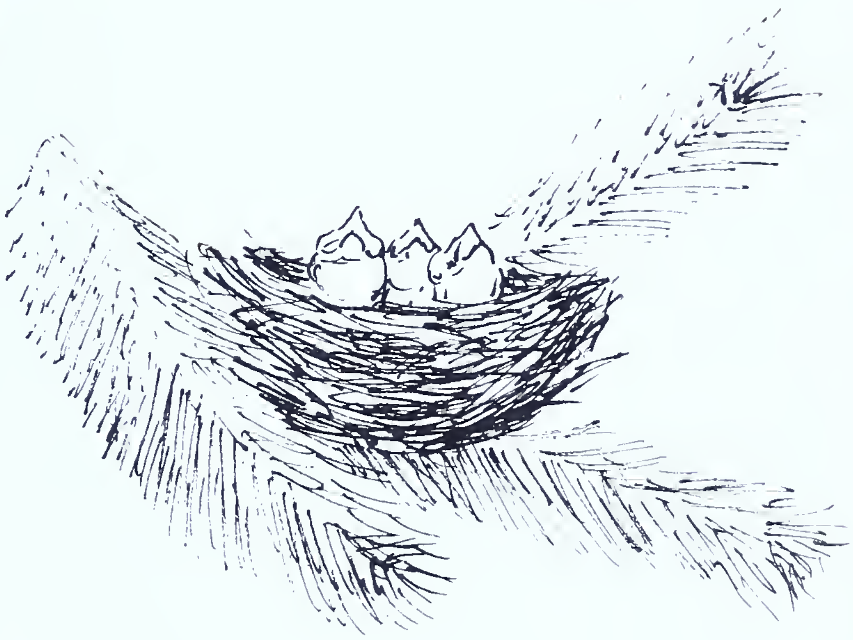
## Gray Catbird

**Habitat**: dense thickets along roadsides, forest edges, backyards
**Nests**: usually less than 6' high in thicket; made of twigs and leaves lined with bark and rootlets
**Eggs**: glossy, dark greenish-blue; 2-6 in a clutch
**Food**: grasshoppers, crickets, beetles, caterpillars, and other insects; fruits such as blackberries, grapes, poke berries; at feeders, mealworms and raisins

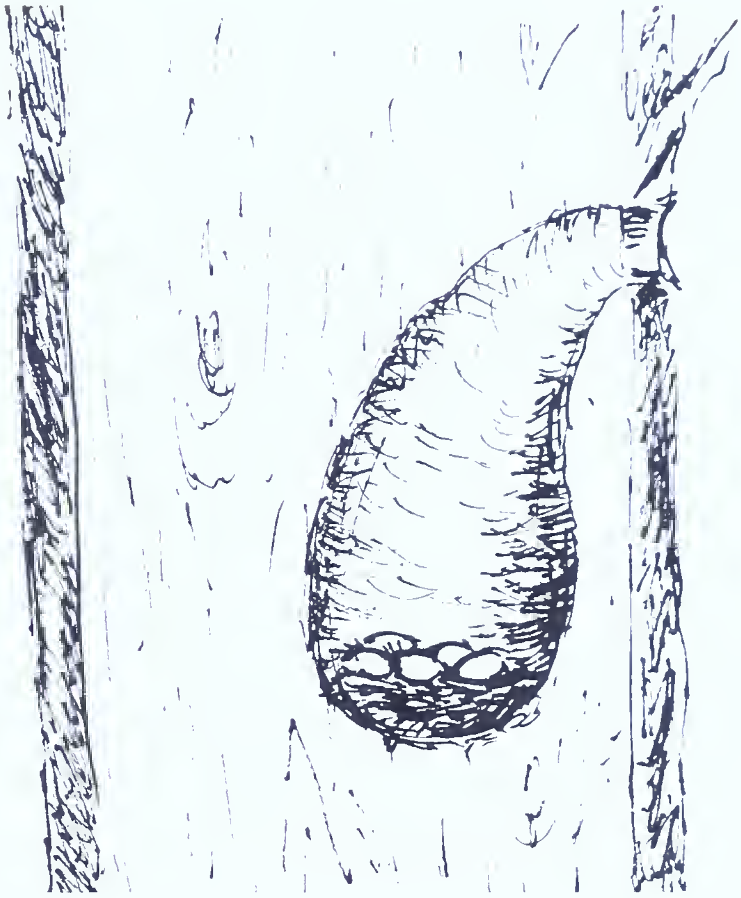
## Tufted Titmouse

**Habitat**: deciduous woods, wooded swamps, backyards, parks, towns, and river bottoms
**Nests**: cavity nester in old woodpecker holes or boxes; made of leaves, moss bark, lined with feathers
**Eggs**: white with brown flecks; 4-8 in a clutch
**Food**: caterpillars, ants, bugs, insects, seeds, berries, cherries, blackberries, acorns; at feeder--sunflower seeds and peanuts

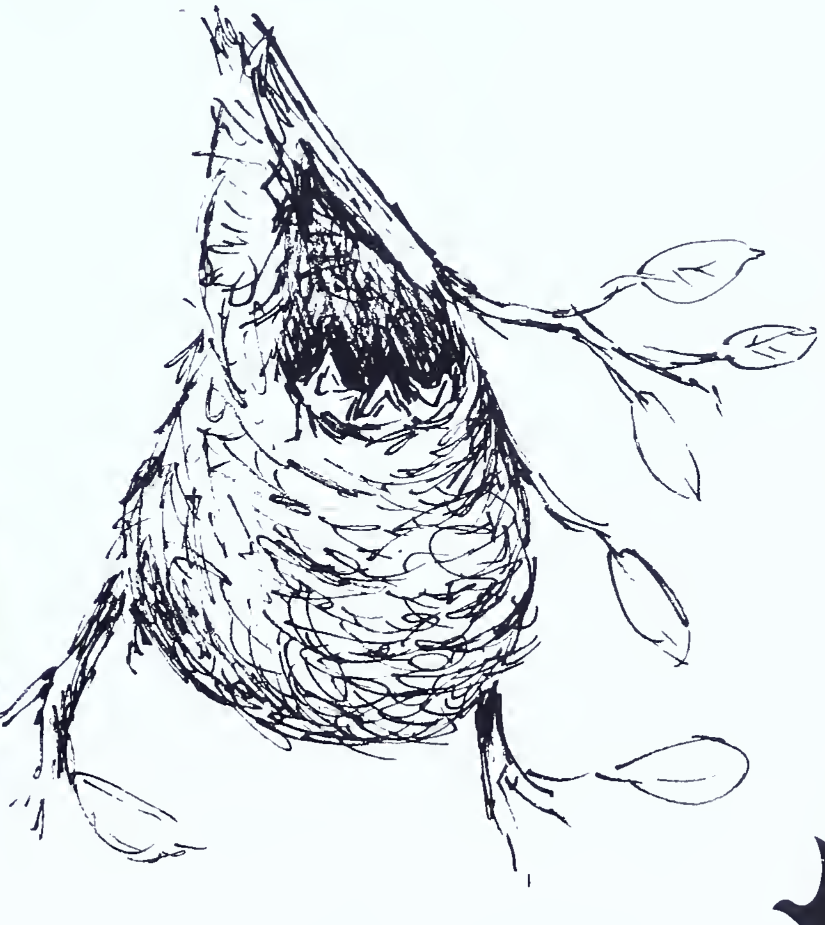
## Northern Cardinal Nest



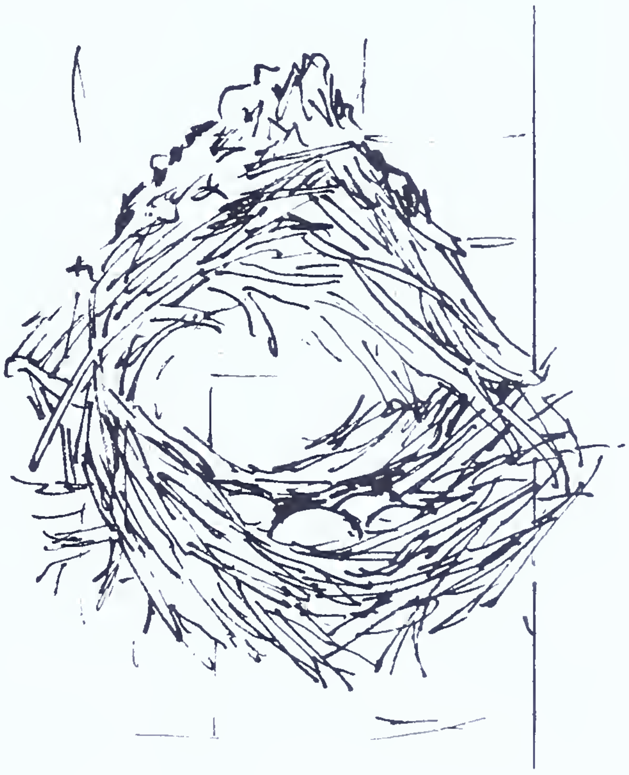
## Black-capped Chickadee Nest



## Baltimore Oriole Nest



## Chimney Swift Nest



## Northern Cardinal

**Habitat**: forest edges, old fields, roadsides, backyards, towns, and parks
**Nests**: usually less than 10' above ground in thickets--nests made of twigs, rootlets, strips of bark, and lined with grasses and rootlets
**Eggs**: whitish; with brown/gray marks; 2-5 in a clutch
**Food**: insects, fruits, berries--such as, blackberries, mulberries and grapes and a variety of seeds--at feeders--sunflower seeds, safflower seeds and white millet

## Baltimore Oriole

**Habitat**: open woods, river bottoms, farms, and towns with large trees
**Nests**: weaves hanging basket nest on outer branches of elms, poplars, and sycamore trees
**Eggs**: bluish-white, marked with dark scrawls; 3-6 in a clutch
**Food**: caterpillars, beetles, ants, true bugs, grasshoppers, cherries, blackberries, grapes and nectar--will come to hummingbird feeders and feeders with orange halves

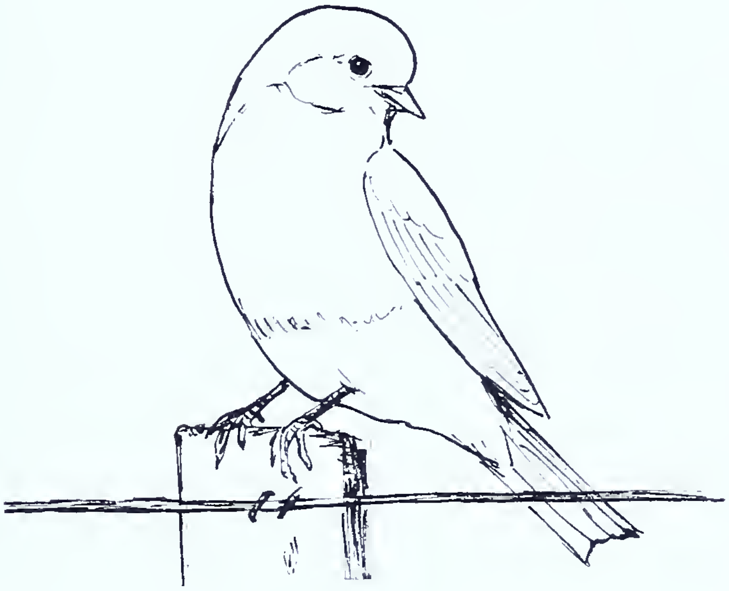
## Black-capped Chickadee

**Habitat**: woods, edges, backyards, parks
**Nests**: cavity nester--excavates own but most often uses old woodpecker hole or nest box; nests are made of moss, hair feathers, and grass lined with plant down
**Eggs**: white with reddish brown spots; 5-10 in a clutch
**Food**: caterpillars, insect eggs, cases and larva, spiders, conifer seeds, berries; at feeders--sunflower seeds, peanut butter, suet

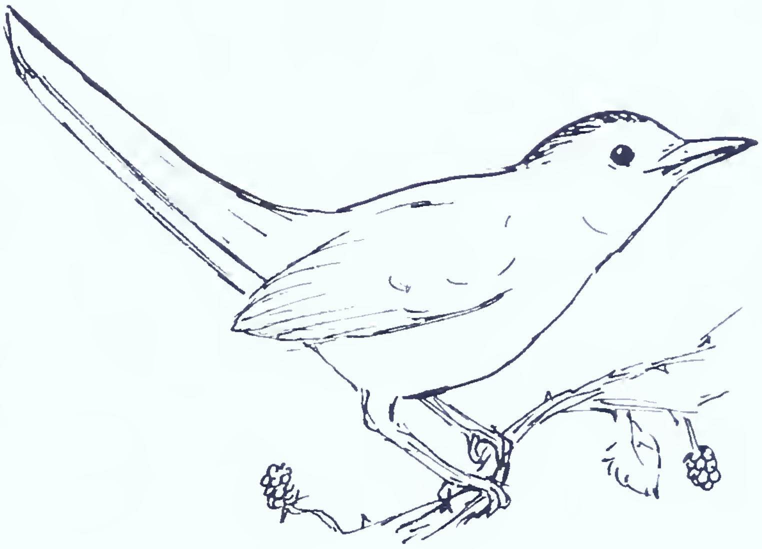
## Chimney Swift

**Habitat**: cities, towns, woodlands, open country, and lakes
**Nests**: half saucer of twigs glued together with saliva found on the walls of chimneys, other buildings
**Eggs**: white; 3-6 in a clutch
**Food**: flying insects; feeds on the wing

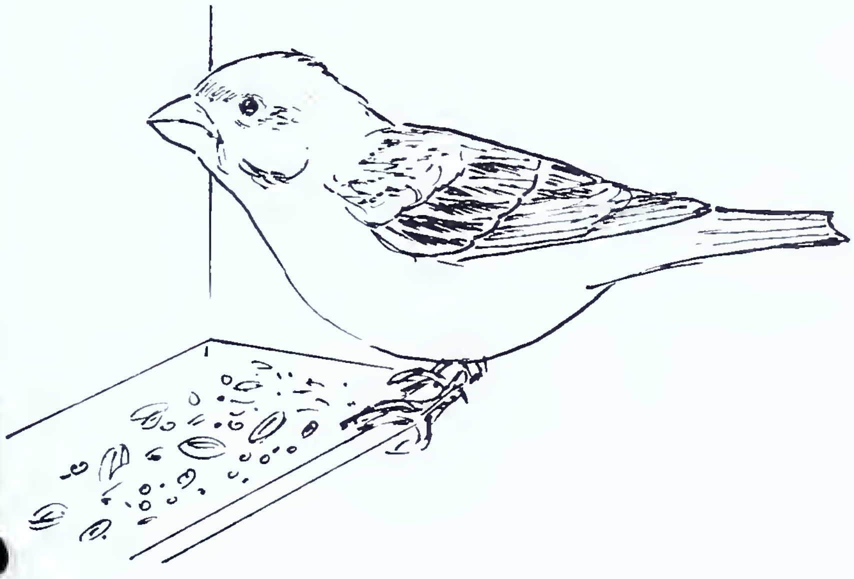
**Eastern Bluebird**



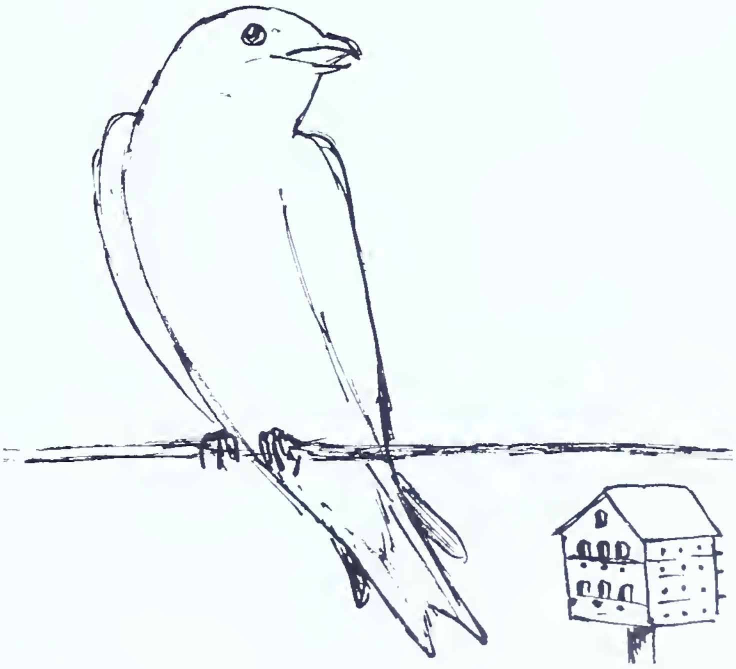
**Gray Catbird**



**Purple Finch**



**Purple Martin**



## Eastern Bluebird
## (winters in southern United States)

**Habitat**: open country, orchards, farms, backyards, parks
**Nests**: nests of grass or pine needles in cavity
**Eggs**: pale blue to white; 2-6 in a clutch
**Food**: insects, earthworms (in fall--fruits of cedar, sumac, grape and pokeweed) (usually migrates in winter but at times will stay and feed at feeders--raisins, mealworms, peanut butter with cornmeal)

## Purple Finch
## (year round resident in some sections of Pennsylvania; winter only in other locales)

**Habitat**: woods, parks, backyards in suburbs and country
**Nests**: in pine and spruce trees, 5'-60' high-- made of twigs, grasses and rootlets lined with hair
**Eggs**: pale green-blue, speckled with blacks, browns
**Food**: tree seeds and wild fruits, some insects

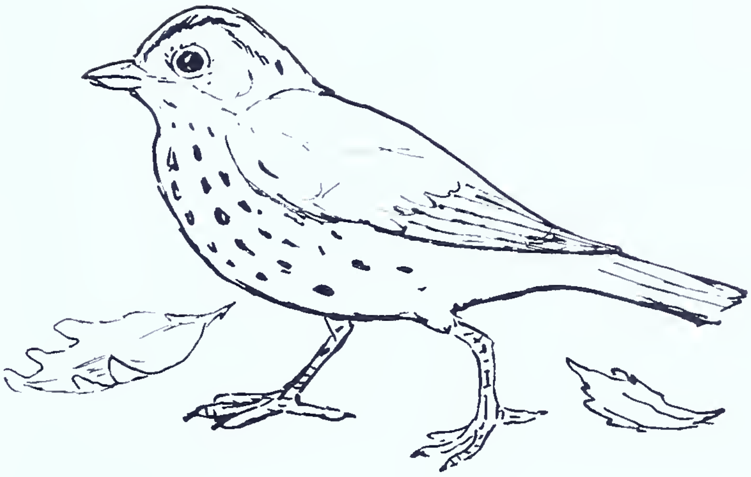
## Gray Catbird
## (winters in southern United States some south to Mexico and Panama)

**Habitat**: dense thickets along roadsides, forest edges, backyards
**Nests**: usually less than 6' high in thicket; made of twigs and leaves lined with bark and rootlets
**Eggs**: glossy, dark greenish-blue; 2-6 in a clutch
**Food**: grasshoppers, crickets, beetles, caterpillars, and other insects; fruits such as blackberries, grapes, poke berries; at feeders, mealworms and raisins

## Purple Martin
## (winters in South America and is considered a neotropical migrant)

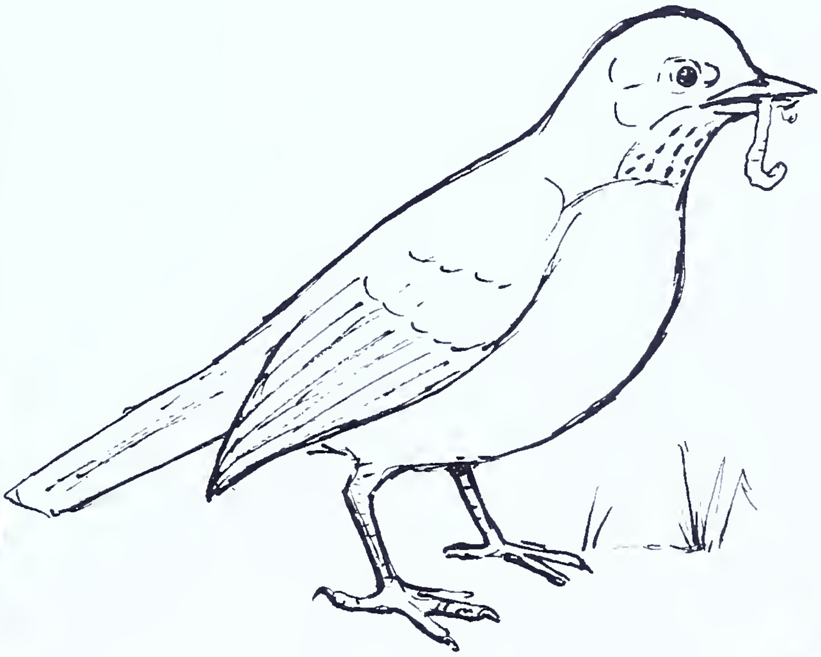
**Habitat**: open country near water; towns, farmland, cemeteries
**Nests**: mud and green leaves, grasses in tree cavities, "apartment birdhouses"--nests in colonies
**Eggs**: white; 3-8 in a clutch
**Food**: flies, mosquitoes, wasps, dragonflies, beetles, ants, bugs, butterflies, moths, bees

**Ovenbird**



**Eastern Wood Pewee**

**American Robin**



**Grasshopper Sparrow**

## Ovenbird
## (winters in central and south America; is considered a neotropical migrant)

**Habitat**: mature forests, without heavy undergrowth
**Nests**: on ground, in slight depression; arched, oven-like nest made of dead grasses, leaves, rootlets, stems, mosses and hair, with opening on the side; often near trail or woods road
**Eggs**: white with brown or gray speckles, 3-6 in a clutch
**Food**: feeds on ground on snails, slugs, earthworms, weevils, beetles, moths, caterpillars, aphids, crickets, ants and spiders, some seeds and berries

## American Robin
## (winters in southern United States)

**Habitat**: forest edges, towns, farmland, backyards, parks
**Nests**: mud-lined cup with fine grasses in crotch of tree from 3'-40' high
**Eggs**: pale blue with no markings; 3-7 in a clutch
**Food**: earthworms, grasshoppers, caterpillars, butterflies, other insects; some fruits such as grapes, mulberry, dogwood

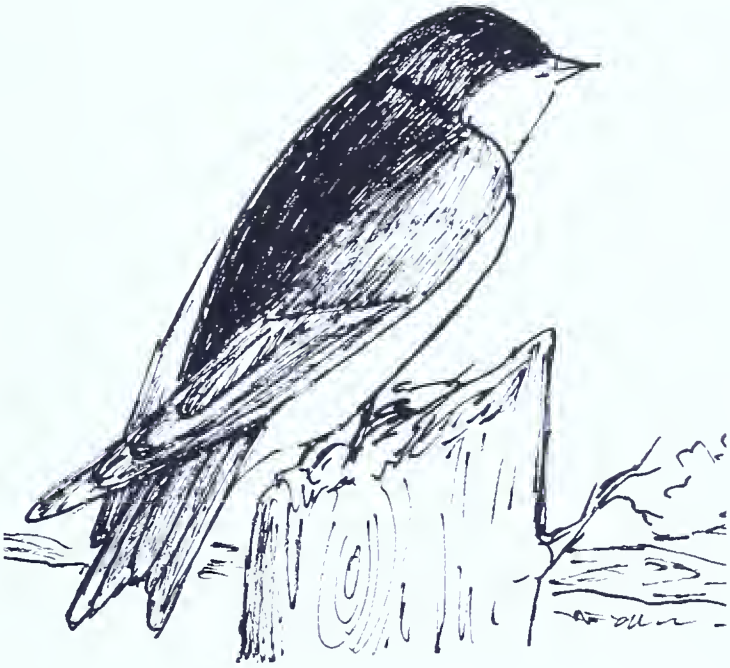
## Eastern Wood Pewee
## (winters in central and south America; is considered a neotropical migrant)

**Habitat**: forests, orchards, and in tall shade trees of parks, neighborhoods; usually found in treetops
**Nests**: on horizontal limb of oak, maple, elm, apple tree, etc. --15'-50' above ground; thick-walled cup around 3" in diameter; built of weed stems, plant fibers, spider cocoon, string, lined with wool, horsehair bits of thread grasses, usually covered with lichens
**Eggs**: cream/white specked or splotched with browns, 2-4 in a clutch
**Food**: mostly flies, beetles, bees, wasps, ants, also tussock and gypsy moths, cankerworms, treehoppers, bugs, grasshoppers, some berries especially elderberries, blackberries, pokeberries

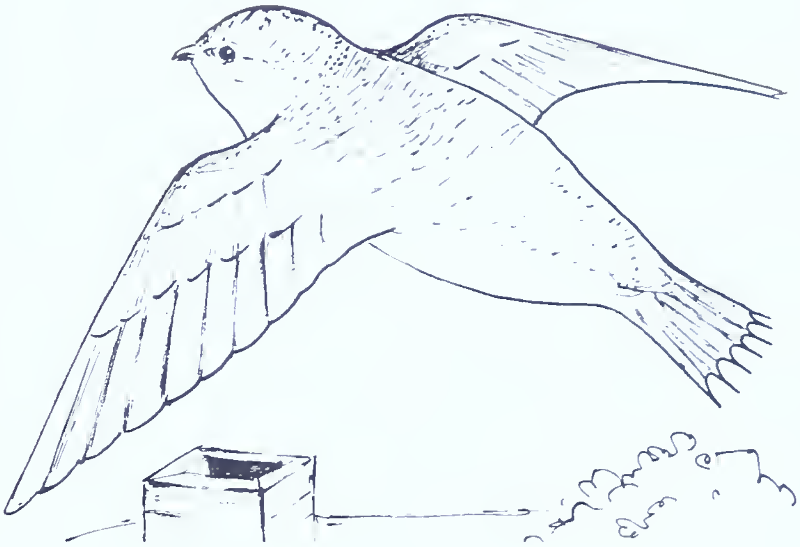
## Grasshopper Sparrow
## (winters in southern United States south to El Salvador, this is considered a partial neotropical migrant)

**Habitat**: grasslands, meadows
**Nests**: on ground at base of clump of grasses, clover, alfalfa, etc.; made of grasses lined with grasses, rootlets, horsehair; usually made in small depression, top usually domed with grass in the back; in loose colonies
**Eggs**: cream, white, speckled/spotted with brown, 3-6 in a clutch
**Food**: eats grasshoppers and most other insects, also spiders, snails, earthworms and seeds of grasses, sedges and weeds

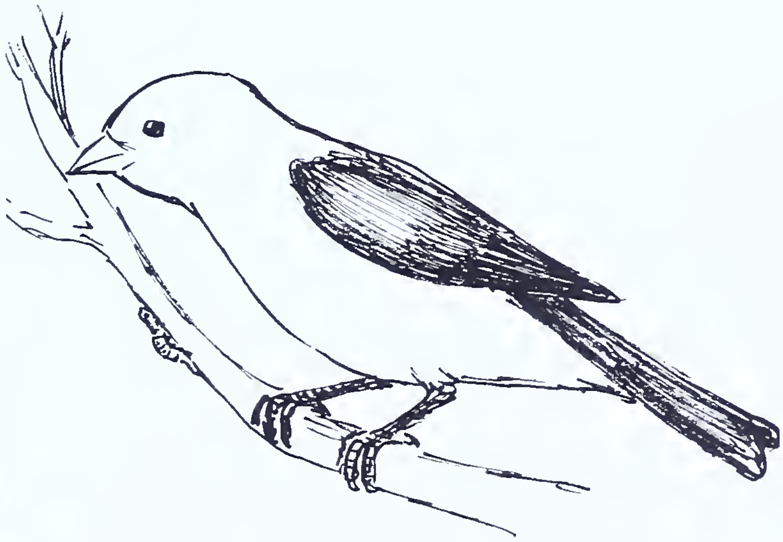
Tree Swallow



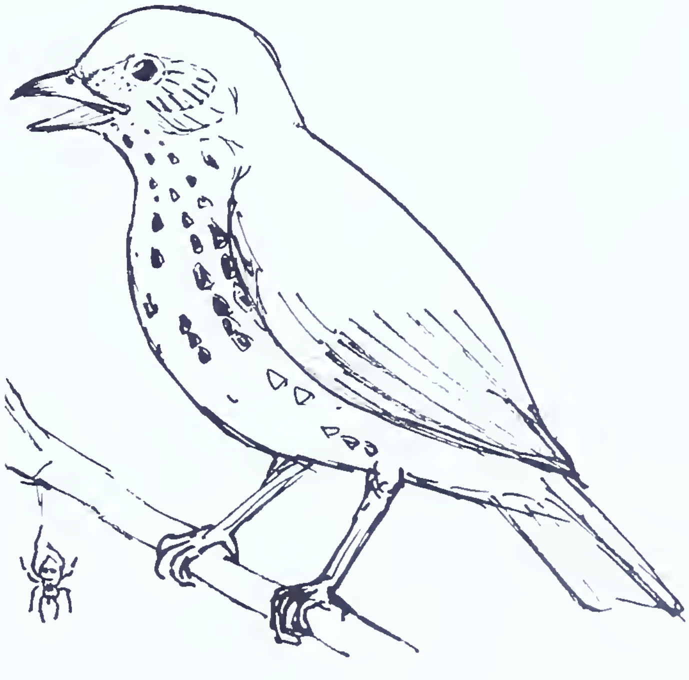
Chimney Swift



Scarlet Tanager



Wood Thrush



## Tree Swallow
## (winters in southern United States and south)

**Habitat**: wet meadows, marshes and fields by ponds and lakes
**Nests**: grassy nest lined with feathers in cavity
**Eggs**: white; 4-6 in a clutch
**Food**: flying insects, some seeds and berries when cold

## Scarlet Tanager
## (winters in central and south America)
## Male: Bright red with black wings and tail during breeding season
## Female: Olive and yellow overall

**Habitat**: forests and areas with shade trees, esp. oaks
**Nests**: on tree limb 10'-70' high; made of fine twigs and weeds, lined with vine tendrils and stems
**Eggs**: pale bluish, speckled with brown; 3-5 in a clutch
**Food**: mainly insects such as ants, beetles, moths and caterpillars; but also, blackberry, dogwood berries and other wild fruits

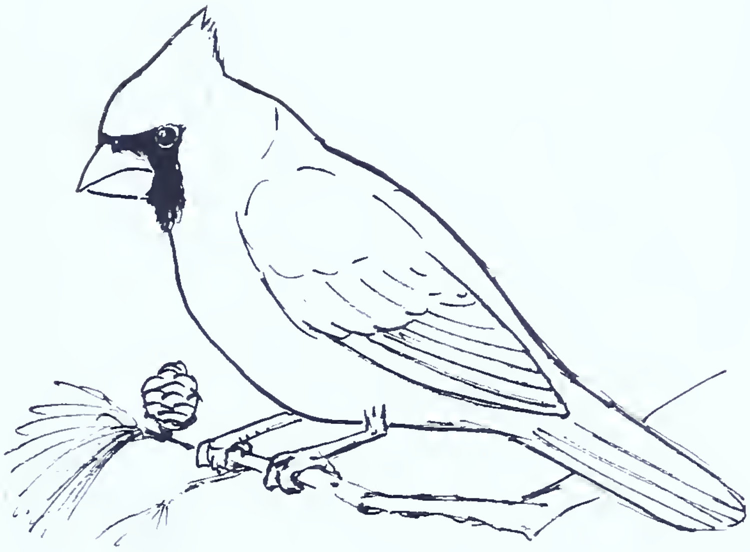
## Chimney Swift

**Habitat:** cities, towns, woodlands, open country, and lakes
**Nests:** half saucer of twigs glued together with saliva; found on the walls of chimneys, other buildings
**Eggs:** white; 3-6 in a clutch
**Food:** flying insects; feeds "on the wing" (while in flight)

## Wood Thrush
## (winters in central and south America)

**Habitat**: deciduous forests; often near streams; has adapted to city and country gardens and parks
**Nests**: in crotch or on branch of shrub or tree, usually 6'-12' from ground but can be as high as 50'; made of mud and twigs with dead leaves, mosses and lined with rootlets; often white paper or cloth incorporated
**Eggs**: blue or blue-green, 2-5 in a clutch
**Food**: insects on or near ground; beetles, ants, caterpillars, moths, grasshoppers, flies, bugs; spiders, sow bugs earthworms, some berries

**Cardinal**



**Black-capped Chickadee**

**Brown-headed Cowbird**

**Tufted Titmouse**

## Cardinal

**Habitat**: forest edges, old fields, roadsides, backyards, towns, and parks
**Nests**: usually less than 10' above ground in thickets--nests made of twigs, rootlets, strips of bark, and lined with grasses and rootlets
**Eggs**: whitish; with brown/gray marks; 2-5 in a clutch
**Food**: insects, fruits, berries--such as, blackberries, mulberries and grapes and a variety of seeds--at feeders--sunflower seeds, safflower seeds and white millet

## Brown-headed Cowbird

**Habitat**: farms, towns, edges or clearings of forest
**Nests**: do not build their own nests, female lays eggs in nest of other birds
**Eggs**: bluish-white speckled with brown
**Food**: corn, wheat, oats, buckwheat, seeds of ragweed, dandelion and some berries and insects; favorite insect is grasshoppers, also eats beetles, caterpillars, alfalfa weevils, cotton weevils, bugs , flies, wasps, ants, some spiders and snails

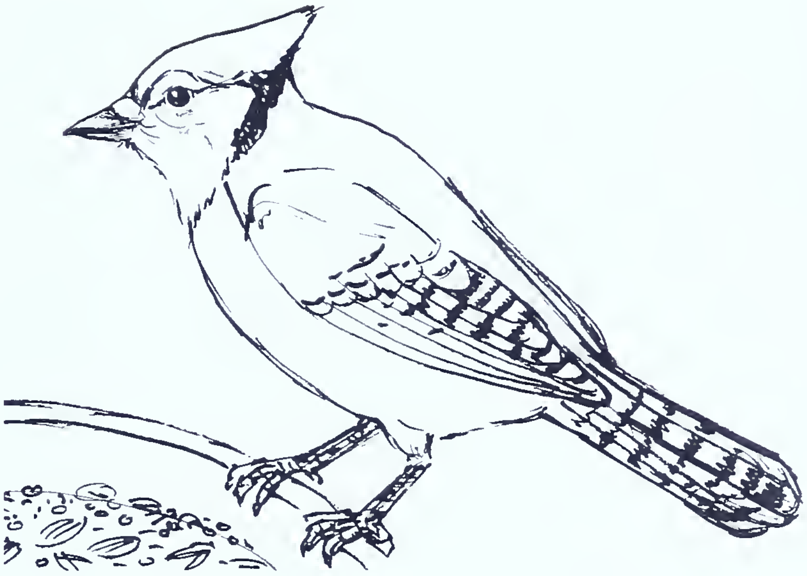
## Black-capped Chickadee

**Habitat**: woods, edges, backyards, parks
**Nests**: cavity nester--excavates own but most often uses old woodpecker hole or nest box; nests are made of moss, hair feathers, and grass lined with plant down
**Eggs**: white with reddish brown spots; 5-10 in a clutch
**Food**: caterpillars, insect eggs, cases and larva, spiders, conifer seeds, berries; at feeders--sunflower seeds, peanut butter, suet

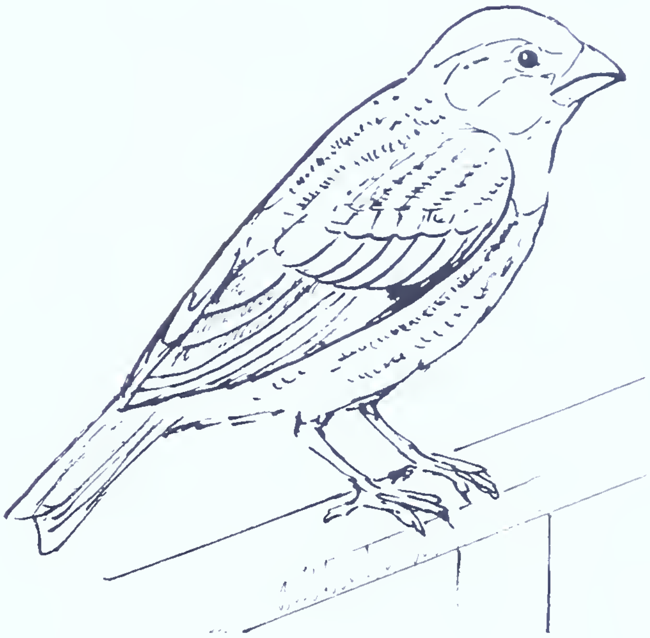
## Tufted Titmouse

**Habitat**: deciduous woods, wooded swamps, backyards, parks, towns, and river bottoms
**Nests**: cavity nester in old woodpecker holes or boxes; made of leaves, moss bark, lined with feathers
**Eggs**: white with brown flecks; 4-8 in a clutch
**Food**: caterpillars, ants, bugs, insects, seeds, berries, cherries, blackberries, acorns; at feeder--sunflower seeds and peanuts

**Blue Jay**



**House Finch**



**American Goldfinch**

**House Sparrow**

## Blue Jay

**Habitat**: deciduous woods, forest edges, parks, towns, backyards
**Nests**: large made of twigs and sticks, lined with grass and feathers-usually 10'-20' high in evergreen tree
**Eggs**: olive, buff, pale green or dull blue, with brown or gray spots; 3-6 in a clutch
**Food**: opportunistic omnivore, 75% plant matter, 25% animal--acorns, corn, cherries, grapes, pole berries, beetles, grasshoppers, small fish, frogs, caterpillars, bird eggs and nestlings; at feeders, sunflower seeds, whole corn, suet and peanuts

## American Goldfinch

**Habitat**: old fields, young forests, roadsides, backyards
**Nests**: built in fork of small branches of trees or shrubs, usually less than 10' off ground; made of thistle, milkweed sown, fine grasses and moss
**Eggs**: very pale blue, no marks; 4-6 in a clutch
**Food**: seeds of thistle, dandelion, goldenrod, birches, conifers, some berries and insects; at feeder prefers thistle and sunflower seeds

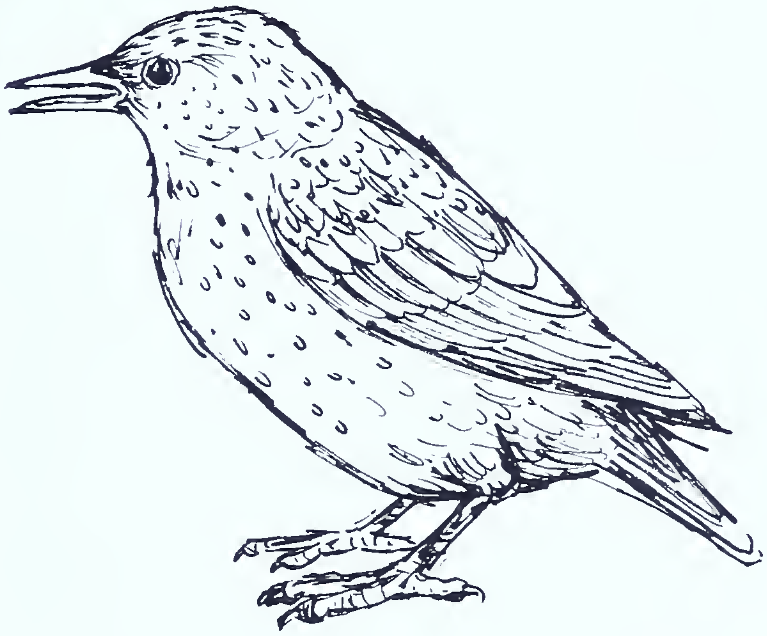
## House Finch
### (originally a western bird--introduced to east in 1940 as pets--birds were eventually released by dealers when authorities cracked down)

**Habitat**: backyards in country, towns, and cities
**Nests**: occasional cavity nesters, also nest in potted plants or ivy covered walls and trees near buildings; made of twigs, grasses and lined with horsehair
**Eggs**: bluish-white with speckles: 2-6 in a clutch
**Food**: seeds, such as thistle, dandelion, and noxious weeds, and some insects

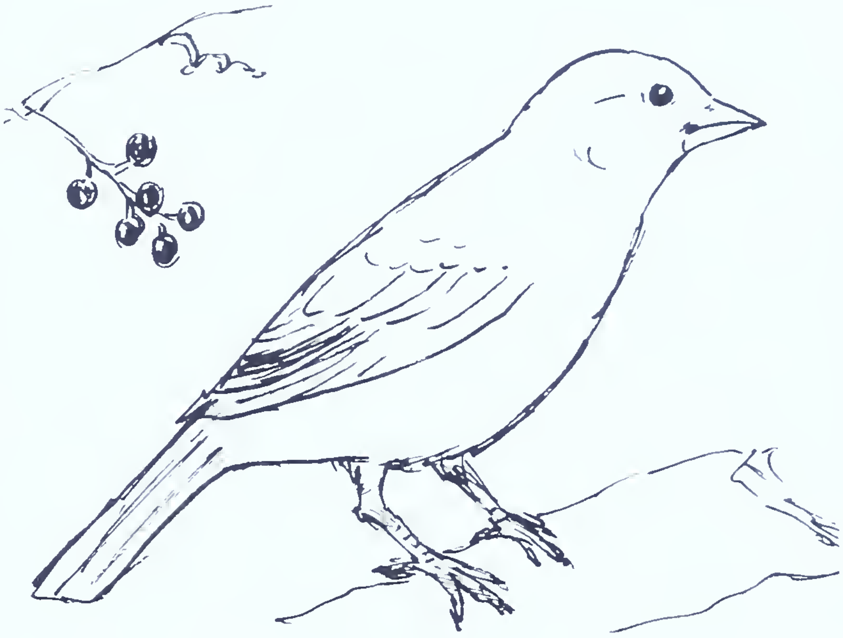
## House Sparrow
### (very aggressive cavity nester--not native to US but intorduced in 1851 in Brooklyn, NY from England)

**Habitat**: farmland, towns, cities, parks, backyards
**Nests**: cavity nester; made of any available material--string, straw, twigs, paper, etc.
**Eggs:** white, pale blue or pale green with a few gray or brown spots; 3-7 in a clutch
**Food**: beetles, grasshoppers, crickets, caterpillars, other insects, grass and weed seeds, corn, wheat, oat--thrives on grocery store bird mixed with fillers

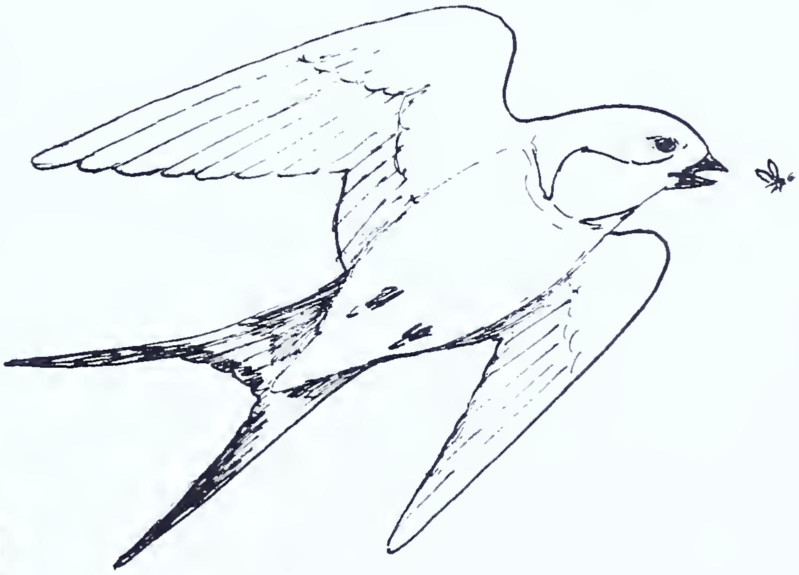
**Starling**



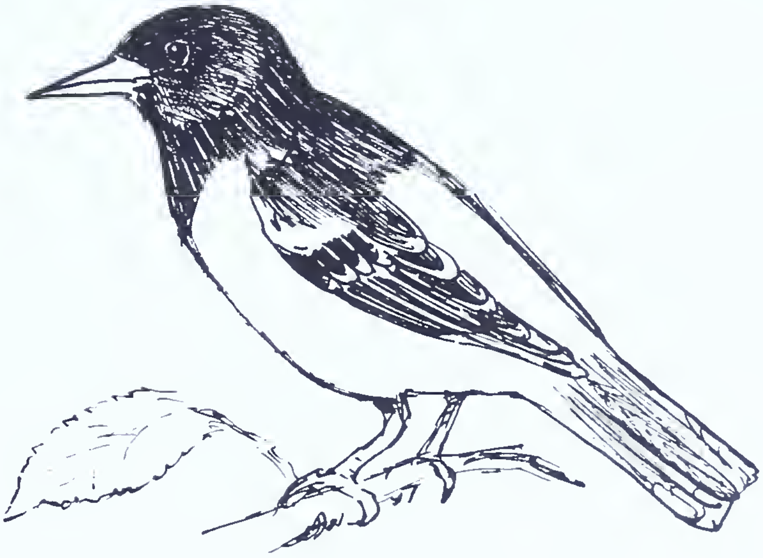
**Indigo Bunting**



**Barn Swallow**



**Baltimore Oriole**



## Starling
## (very aggressive cavity nester; not native; introduced in NY in 1980)

**Habitat**: farmland, town, cities, backyards
**Nests**: cavity nester--large, poorly formed of grasses and twigs
**Eggs**: white, pale blue or greenish white; 2-8 in a clutch
**Food**: cutworms, Japanese beetles, grasshoppers, clover weevils, beetles and other insect; at feeder--peanut hearts, corn and other grains

## Barn Swallow
## (Pennsylvania breeder, winters in Panama south to South America)

**Habitat:** nests on or inside farm buildings, under bridges, and inside culverts
**Nests:** nests in pairs of small colonies; cup of mud or clay pellets mixed with straws, dried grasses, lined with poultry feathers, horsehairs, plastered to side of horizontal or vertical surface
**Eggs:** 4-5, white spotted with specks of brown
**Food:** catches flying insects in the air (on the wing); drinks and baths by skimming water

## Indigo Bunting
## (breeds in Pennsylvania, winters in South America and Southern tip of Florida)

**Habitat:** woodland clearings and borders, brushy pastures.
**Nests:** crotch of saplings, small bushes, and thickets, 5-15 feet up; made of dried grasses, dead leaves, snake skin, strips of bark, moss, facial tissue, lined with soft materials such as feathers and horsehair
**Eggs:** 3-4 blue white, usually unmarked
**Food:** forages trees, shrubbery and on ground for grasshoppers, beetles, goldenrod, aster, thistle, small grains, and some berries

## Baltimore Oriole
## (winters in Mexico and South America; is considered a neotropical migrant)

**Habitat**: open woods, river bottoms, farms, and towns with large trees
**Nests**: weaves hanging basket nest on outer branches of elms, poplars, and sycamore trees
**Eggs**: bluish-white, marked with dark scrawls; 3-6 in a clutch
**Food**: caterpillars, beetles, ants, true bugs, grasshoppers, cherries, blackberries, grapes and nectar--will come to hummingbird feeders and feeders with orange halves

GARBAGE RECEPTACLE